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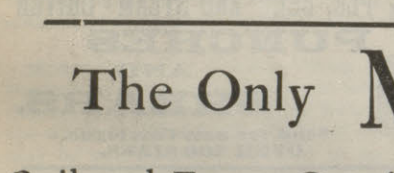

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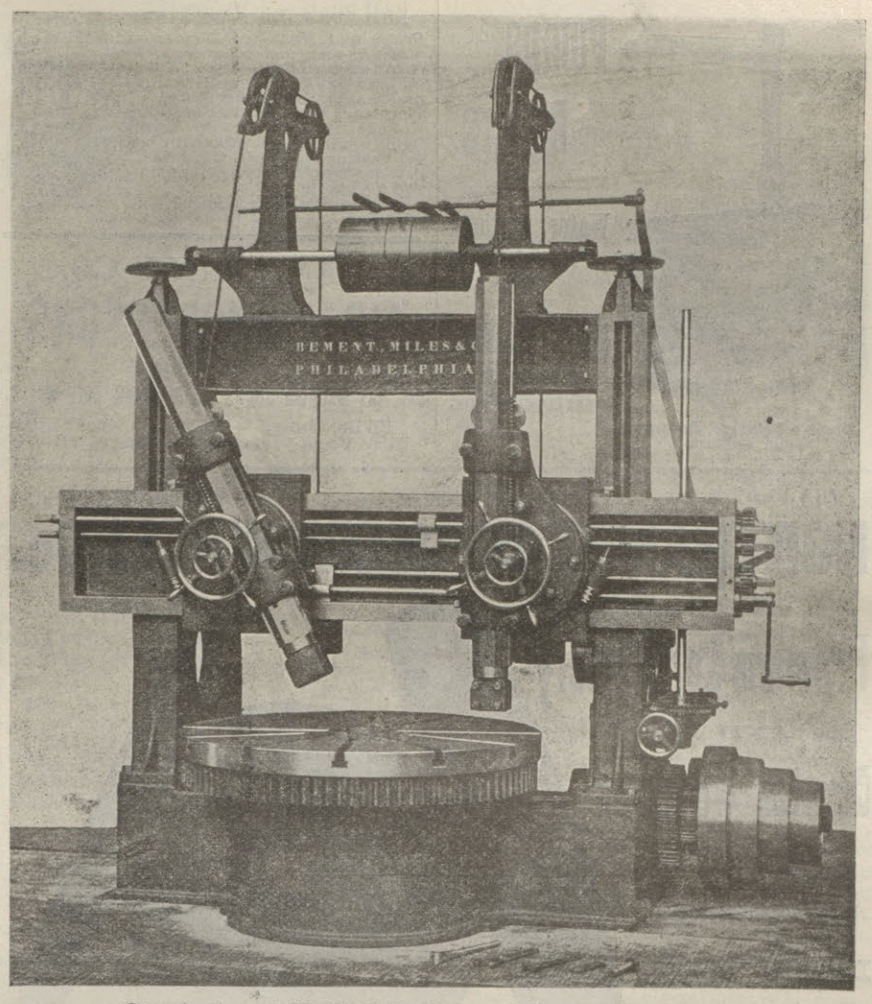

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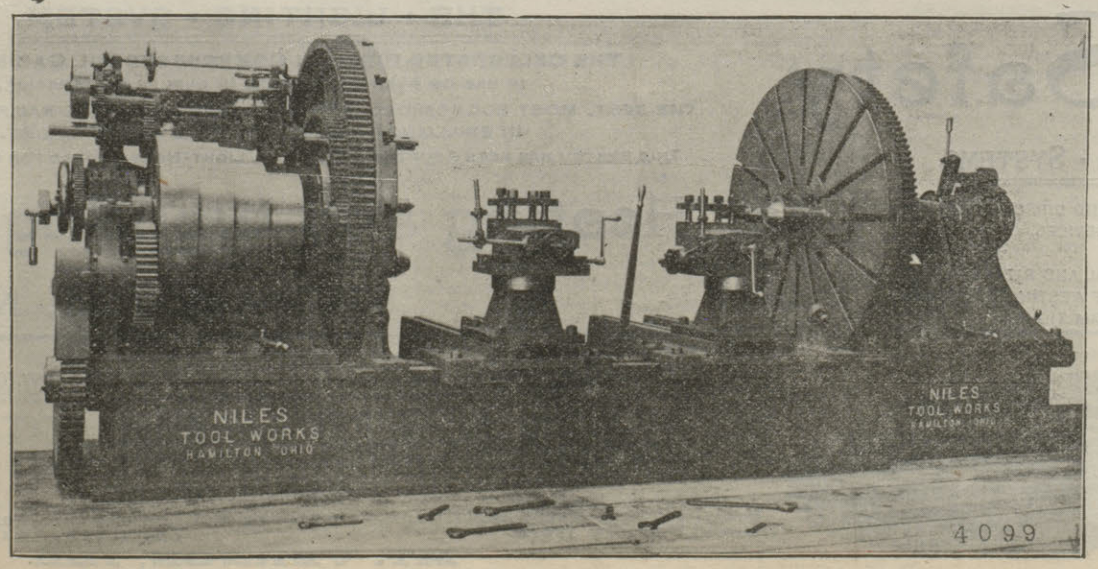

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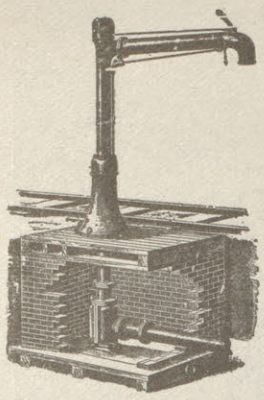

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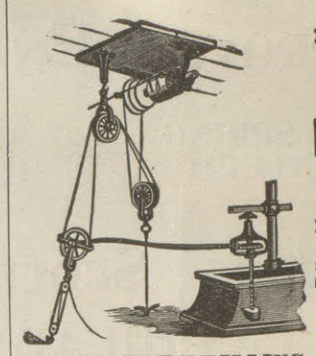

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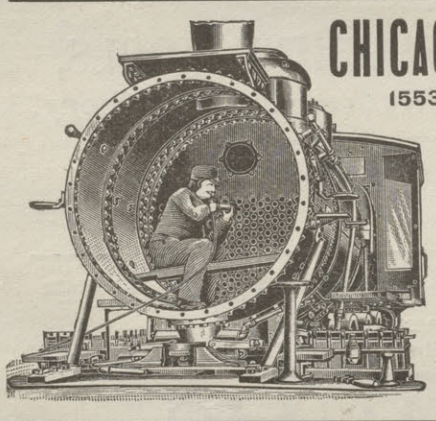

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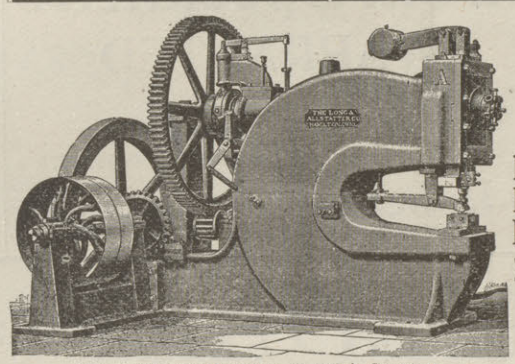

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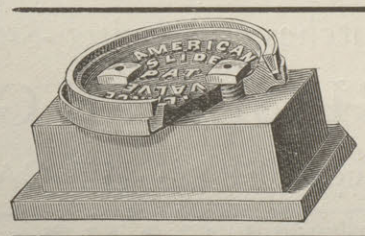

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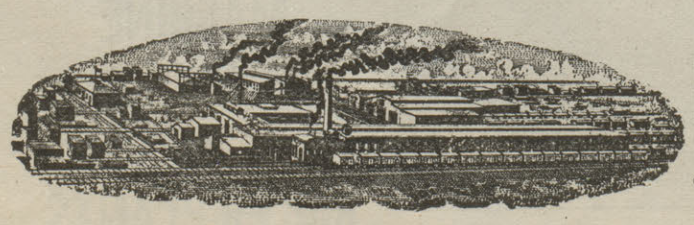

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THE RAILWAY REVIEW

XXXVI. FEBRUARY 8, 1896. No. 6.

ROAD CROSSINGS.—No doubt, before this month passes the crossing planks that were torn up to allow the flanger to operate will be ordered put down again. These plank are usually sixteen feet long, and it frequently happens that they are broken or split in trying to pry them out of their frozen bed. Then, if in addition they are partially rotten, a foreman will have some difficulty in getting all the pieces back without making the crossing look like a large crazy-quilt. The best way to do is for the foreman to cut what good plank he has in two and use as many eight foot pieces of the broken ones as may be necessary to complete the crossing. It has always been a puzzle to know by what process of reasoning the conclusion was reached that ties for four feet and eight and one-half inch track should be eight feet long, while a wagon with the same gage must be supplied with sixteen foot track, and yet 178,000 miles of railroad in the United States are dotted with private farm crossings, containing this same waste of lumber. It is worse than wasted, because the long plank generally covers a joint and this is often allowed to get in very bad shape before the section foreman will take the time to tear up the entire crossing in order to repair the track.—Jerry Sullivan in Roadmaster and Foreman.

METAL PAINT.—If you ever want to make a paint that will protect iron, prevent it from rusting and, at the same time, secure a glossy covering that can be made in different colors, says J. H. Allen in Dixie, the work will be easy if you take some sandrax gum, dissolve it in alcohol, and add the pigment necessary to secure the proper color. A case was cited a short time since of a steam engine that was painted with this mixture, which, without the pigment, is very transparent. The engine always remained clean, and the iron never showed the slightest trace of rusting. Two years afterward it became necessary to clean the engine, and so closely did the covering adhere that it cost nearly $100 to remove it, and that after it had been exposed to the action of gas and steam for the time named. It must not be thought, however, that any vegetable gum that is soluble in alcohol will show such results, for while they may have a good gloss and be apparently hard and firm at the start, they are worthless when exposed to the weather.

While on the subject of the painting of iron work, there is one precautionary measure that is very frequently neglected; and that is the thorough cleaning of all parts before the paint is applied. To paint over a casting to which particles of sand are still adhering is an act of foolishness in comparison with which the building of a house upon the sands is an act of great wisdom and keen forethought. The same rule should be applied to wrought iron work, and do not put paint over scale, for it is only a matter a few days before the whole will peel off. One concern uses a sandblast for cleaning wrought work, and so rapidly does this system do its work that 3 in. angles can be thoroughcleaned at the rate of four feet a minute.

MAKING HOLES IN GLASS.—Strong glass plates are bored through by means of rotary brass tubes of the necessary diameter, which are filled with water during boring. To the water is added finely powdered emery. Thinner glass may be perforated with holes in an easier manner, by pressing a disc of wet clay upon the glass, and making a hole through the clay of the size required, so that the glass is laid bare. Molten lead is then poured into the hole, and lead and glass drop down at once. This method is based upon the quick, local heating of the glass, whereby a circular crack is produced, the outlines of which corresponds to the hole made in the clay. When molten lead is poured upon clay so that steam is generated from the moisture, the lead is very apt to fly. Putty, although of course more expensive, is much to be preferred to clay for use in connection with molten lead.

OCEAN DEPTHS.—A sounding has recently been taken in the Pacific ocean, near the coast of Japan, which showed a depth of 29,400 feet, or approximately five and a half miles. This is a little more than the hight of the loftiest mountain. How much deeper the Pacific is than this it is impossible to tell—the wire having broken, presumably through its inability to sustain its own weight. In a previous attempt to reach the floor of the ocean at this spot the wire broke at the depth of 25,800 feet. It has been suggested as one theory of the formation of mountain ranges, that they represent the crumpling up, or buckling, of the earth's crust under the severe contraction strains that were set up as the surface of the globe solidified. If this be true, the deep ocean valleys or gorges, such as this off the coast of Japan, must be the result of the same action. Taken in connection with the loftiest mountain, this sounding gives a difference in distance from the earth's center of about twelve miles, or 1-333 of the earths radius.

SOLDERS FOR GLASS.—Mr. Charles Margot finds that an alloy composed of ninety-five parts of tin and five of zinc melts at 200 degrees, and becomes firmly adhered to glass, and, moreover, is unalterable, and possesses a beautiful metallic luster; and, further, that an alloy composed of ninety parts of tin and ten of aluminum melts at 390 degrees, became strongly soldered to glass, and is possessed of a very stable brilliancy. With these two alloys it is possible, says the Pottery Gazette, to solder glass as easy as it is to solder two pieces of metal. It is possible to operate in two different manners. The two pieces of glass to be soldered can either be heated in a furnace and their surfaces be rubbed with a rod of the solder, when the alloy as it flows can be evenly distributed with a tampon of paper or a strip of aluminum, or an ordinary soldering iron can be used for melting the solder. In either case it only remains to unite the two pieces of glass and press them strongly against each other, and allow them to cool slowly.

SENSELESS OPPOSITION TO CORPORATIONS.—Attorney General Moloney is winding up a year of ineffectual and sensational attacks on large Chicago corporations by casting his net for the Illinois Steel Company. His first effort was against a large car building corporation, his next against the elevator interest. In both instances, says the Chicago Journal of Commerce, it was a case of shooting promiscuously and bringing down nothing. There are two points worthy the study of the attorney general: the first is that political bias never yet actuated a crusade that succeeded; the next is that it is poor policy to cater to the sentiments of that reckless and destructive class who possess a vengeful desire to include every large and prosperous business enterprise in the category of "trusts," and treat them as thieves and pirates. The legitimate industries of this state are too firmly entrenched to pay much attention to sentimental popgun tactics for their avowed demolition, but there is a point where business men will not tolerate the retention of an official who wastes public time in puerile prosecution, when his energies should be devoted to protecting and enhancing the industrial and commercial interests of a community that makes it possible for him to earn his living in an easy manner.

DECREASE OF ENGLISH LOCOMOTIVE BUILDING.—The following figures, compiled on behalf of the Glasgow Herald, show a steady decrease in the number of men employed in the locomotive trade of Great Britain:

	1891.	1892.	1863.	1894.	1895.
Neilson & Co.	2,584	2,307	1,896	1,510	1,617
Beyer, Peacock & Co., Limited	1,971	1,292	1,359	1,239	1,196
Dubs & Co.	1,940	1,697	1,775	1,465	1,773
Sharp, Stewart & Co., Limited	1,565	1,507	1,246	1,145	1,178
Kitson & Co.	1,270	1,268	1,079	1,143	915
Vulcan Foundry Co., Limited	666	561	486	610	514
Nasmyth, Wilson & Co., Limited	419	377	320	349	337
Manning, Wardle & Co.	447	267	293	236	314
Hunslet Engine Co.	282	240	245	234	242
	11,803	9,971	9,043	8,251	8,473

ACETYLINE GAS.—In a communication to the Comptes Rendus, M. L. Brociner states that the common opinion as to the very poisonous properties of acetylene is wrong; animals breathing air charged with it did not succumb after several hours' exposure, provided care was taken to keep a sufficient supply of oxygen. It is true that the gas is absorbed by the blood, but the compound, if any, is exceeding unstable, and not to be compared to that found on the absorption of carbonic oxide. In fact, M. L. Brociner concludes that the gas is not one whit more poisonous than ordinary hydrocarbons, such as ferroene, ethylene, and propylene. In view of the proposed use of acetylene as an illuminant, these observations are of importance. Whatever may be the candle power of acetylene gas, it certainly is a bad illuminant on the question of its own cost, or the profit in its manufacture, for, says Engineering and Mining Journal, not one of all its votaries has yet been able to make any statement capable of analysis which would show that its actual cost would render it a serious competitor of our present poor gas, or that the "rights" of the Electro Gas Company will enable that concern to earn more than a modest competitive manufacturers' profit on the business of making and distributing it.

THE "TRAIN CALLER" NUISANCE.—We learn from a Kansas paper, says the Railroad Gazette, that the train caller at the Kansas City Union station, J. F. Gregory, has been obliged to retire from that position because he has lost his voice. He has "long been noted for his stentorian tones," and we are told that the people of Kansas will miss him. We judge from the friendly tone of the paragraph that Mr. Gregory has been an efficient shouter, and we are sorry to hear that he is incapacitated for the pleasant duties of his position. We have no doubt that he was a skillful elocutionist and that when he pronounced the names of a dozen towns in succession he took time to enunciate the words so distinctly as to make them intelligible, at least so far as to make each name plain to the passengers bound for that particular town; but in expressing our sympathy with Mr. Gregory we feel compelled to say that that there are numerous other train shouters in large railroad stations whose voices, if they should get lost, would be doing the public a favor. Such an occurrence would be a reason to congratulate the passengers rather than to sympathize with the shouter. Thousands of long-suffering passengers have for years endured the depressing influence of these brawlers' inarticulate attempts to earn their wages, and we are anxiously looking forward to the time when we can rejoice with them over the removal of this cloud on their happiness. By the way, what is the use of giving the name of more than one town, or at most two, in announcing a train? The name or number of the train and suitable placards at the doors ought to meet all reasonable demands of passengers who understand English, and those who do not uunderstand English have to be individually advised, in any event we never heard of a passenger whose native tongue was the same as that of the train bawler.

POWER TRANSMISSION BY ROPES.—In a paper on "The Transmission of Power by Ropes and Belts," read before the French Society of Civil Engineers by V. Dubreuil, it is stated that one great advantage possessed by ropes is that cyclical variations in the speed of the driving pulley are "damped" by the ropes, so that the speed of the driven pulley is much more uniform than that of the driver. Ropes are also useful when the two lines of shafting are not perfectly parallel. The velocicity of the rope should not be less than about 1500 ft. per minute, nor more than 5000 ft., while with belts a velocity of as little as 600 ft. per minute may be used, but the maximum should not exceed 4000 ft. per minute, above which the centrifugal force prevents the poper adhesion of the belt to the pulley. From great distances between the lines of shafting, ropes should be used; although in exceptional cases they may be employed with as little as 12 ft. between shaft centers, in general the distance should not be less than 20 ft. Spans of as much as 328 ft. have been worked by ropes with only one intermediate support Under no circumstances should the diameter of the smallest pulley be less than 30 times the diameter of the rope.

BURSTING OF FLY WHEELS.—A single month brings at least three serious accidents by the breaking of large fly-wheels, and the future will no doubt furnish the same proportion until there is a limitation of some kind to the methods and material now employed. Cast iron is not a suitable material for such wheels, and is not necessary. We do not say cast wheels, because that is absurd, and has been abandoned for the same reason that cast spokes and rims must be before long. It was something or indeed a good deal, to be rid of inherent strains due to casting whole wheels. It was going half way, but there will be no immunity from accident until this material is discarded. Methods of construction with fibrous material have advanced so fast that people have not perceived how it can be applied to fly-wheels. They continue in a rut, bolting up a huge masses of cast iron to move at from 60 to 100 ft. a second when there is no warrant for such a thing in analogous construction. For example, the lateral or circumferential strain on the shell of a boiler is not different from the centrifugal strain on a wheel rim, but no one thinks of making cast iron boiler shells.

MAKING A PROPELLER AT SEA.—Although there are several instances on record of mending a broken shaft at sea there is none, on record at least, of making a new propeller. Yet, that says the Marine Journal is what the chief engineer of the steamer Strathnevis had nearly accomplished when she was taken in tow after having been a month helplessly adrift on the Pacific. This propeller was constructed by heating iron sheets, cutting them to the right measurements and hammering them into the proper shape. It had a length from tip to tip of 7 ft. 6 in., and by bolting the sheets together he obtained a thickness of from one-half inch at the tip to three inches at the boss. Straps were bolted from tip to tip to hold the blades rigid and holes were bored through the boss. Had any favorable weather occurred it was the intention to shift the cargo sufficiently to tip the ship and bolt this ingenious contrivance to the shaft, and there is no doubt but that use would have given the ship a speed of from three to five knots.

A NEW COLORING FOR IRON WORK.—A suitable medium for coloring iron and steel a dead black, it is said, may be produced by mixing together one part bismuth chloride, two parts mercury bi-chloride, one part copper chloride, six parts hydrochloric acid, five parts alcohol and fifty parts water. In order to secure the most satisfactory results—the article to be treated being first made clean in every respect, and free from grease—the preparation is applied with a swab or brush, or better still, the object may be dipped into it, the liquid being allowed to dry on the metal, and the latter then placed in boiling water and the temperature maintained for half an hour. If after this the color is not so dark as may be desired for the purpose, the operation is simply repeated, the required density being thus easily attained, and after obtaining the desired degree of color the latter is fixed as well as improved generally by placing for a few moments in a bath of boiling oil and heating the object until the oil is completely driven off.

PHOTOGRAPHING IN COLORS.—The indirect method of photography in natural colors of Cros and Ducos du Hauron presents two points of difficulty—the selection of the colors and the preparation and superposition of the monochromatic films. For the preparation of the color negatives the authors make use of orange, green and violet screens, using with each a photographic plate possessing a maximum sensibility for the rays that the screen allows to pass through it. The preparation and superposition of the monochromatic films is attained in the following manner, as described in the "Journal" of the Society of Chemical Industry: A glass plate is coated with a 10 per cent solution of glue, containing 5 per cent of ammonium bichromate and 5 to 10 per cent of bromode of silver emulson, and then exposed under a negative. After sufficient exposure the plate is washed in cold water and freed from silver bromide with hypo, and in this way a scarcely visible image of insoluble mucilage is obtained, which can be colored with suitable dyes. Three of these monochromatic films, colored red, yellow and blue, each of which has been obtained from the corresponding color negative, are then superposed on the same plate, care being taken to isolate each film from the others by an impermeable film, say, of cellodion. This process allows of the relative intensity of the monochomes being varied, or of the addition of a fourth or more films.—The Engineer, London.

GLUE JOINTS IN BELTS.—In regard to joining leather belts, a correspondent writing to Woodworker says: "I have always had the best results by using common carpenter's glue, such as we use in the shop. I mended an old belt that drives a pony planer. The driver is 32 in., the driven 10 in., centers about 11 ft., and the belt has to be crossed. There are eight splices in this belt, all glued, and and not a rivet in any one, as I consider rivets in a belt a perfect nuisance, and of no use whatever, except to weaken the belts where the rivets are put through. I also used a glued belt on the under head of a molding machine and on the side spindles. I have used glued belts on matcher-head spindles and always with the best results. The reason so many fail in their efforts to produce the best results is because they do not give enough attention to the details. My modus operandi is this: Scarf the ends with a plane and make a good length of splice. Have all nice and equal, so it will be same thickness as the rest of the belt when glued. Here is where the secret lies to make it hold: Before gluing give all the ends a sizing of thin glue in order to thoroughly fill up the pores in the leather. Let this get perfectly dry, then glue in the ordinary way, and let the glue get good and dry before using. I always give such a joint a good dose of neatsfoot oil to limber it up. The belt referred to has been in use now two years and

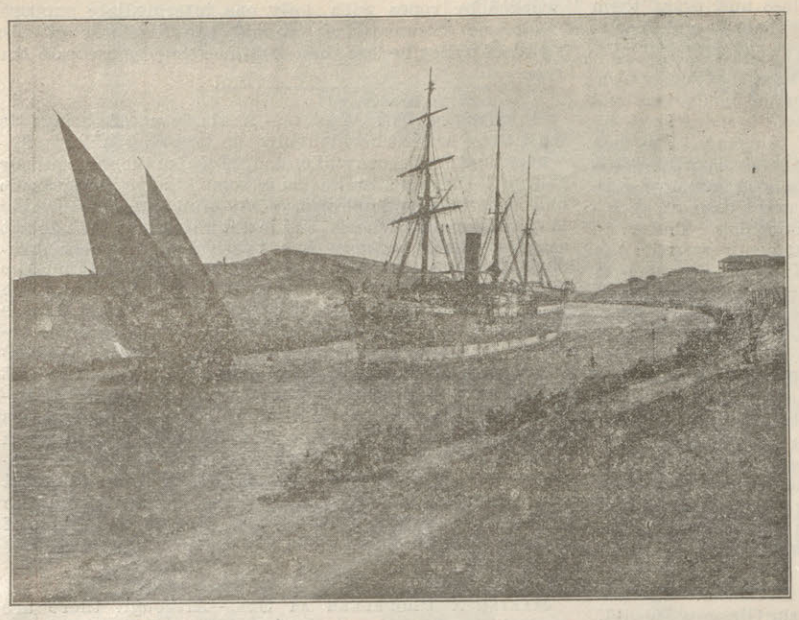


FIG. 1—SUEZ CANAL—EL GUIRISH CURVE.

FIG. 2—SUEZ CANAL—CONVEYOR DREDGE.

nly repaired once with a new lace. Experience has taught me that it is money in pocket to make all repairs as thoroughly as possible.

ORIENTAL RAILWAYS.*

BY CLEMENT F STREET.

It was my pleasure to be the engineer for the Commission World's Transportation of the Field Columbian Museum, which was formed for the purpose of col , lecting information for the completion of the museum of the world's railways, which is a department in the Field Columbian Museum, located at Jackson Park, this city.

We left London on October 8, 1895, after having spent one month in that city making preparations for a tour through the east and in looking over the wonderful railway terminals of that city. The first country visited was Tunis, North Africa, and, from a tourist's point of view, the city of Tunis is one of the most interesting points we visited throughout our entire journey; but, from an engineering standpoint, there is not very much to be found in either the city or country. The railways of the country are three in number, but two of them are rather insignificant affairs and hardly more than suburban lines. The third is the Bone-Guelma Railway, which is a system of about 376 miles, having its eastern terminus in the city of Tunis and its western end connecting with the Paris, Lyons & Mediterranean Railway, which, together with the East Algerian Railway, forms a continuous line between Tunis and Oran. All of these railways were built and are owned by Frenchmen and subsidized by the French government for military purposes. One branch of the Bone-Guelma Railway, extending from Tunis to Bisert, has recently been completed and is intended almost solely for military purposes.

The Bone-Guelma Railway, the Paris, Lyons & Mediterranean, and also the East Algerian, are similar in all respects. The gage is 4 ft. 8½ in., the ties are mostly of wood, although steel is being used experimentally; the rails are of the T pattern, the roadbed is kept in excellent shape, the ballast is usually of broken stone, and where fence is used at all it consists of a prickly pear hedge. Each switch has a disc signal set on top of a high iron post and operated by a lever on the base of the post. The bridges are stone arches and deck girders of steel, and there are numerous tunnels and retaining walls, which are unusually fine pieces of cut stone masonry. The stations are neat and substantial looking structures of uniform design and built of cement or concrete with stone facing and tile roofs. Wood of all kinds is very scarce in these countries and many peculiar and striking substitutes for it are seen on all sides.

From North Africa we went to Egypt, and there found one of the best and most complete railway systems it was our pleasure to inspect. The railway is owned by the government, but the general manager and locomotive superintendent are both Englishmen, and therefore the English style of

FIG. 4—CHUPPA RIFT BRIDGE—MUSKAF BOULAN.

equipment is used. The locomotive superintendent is Mr. F. R. Trevithick, a grandson of the father of the locomotive, and the engines he has designed and is operating would be a credit to any railway in the world. The chief engineer of the line is Mr. M. Nicour, a Frenchman, and while he may have had some engineering problems to solve in constructing the road along the upper Nile, about Cairo the line is perfectly straight and on a dead level. Most of the line is laid with bull-head rails resting on cast iron pot sleepers, but this practice is being abandoned in favor of pressed steel sleepers. All trains are operated under the manual block system, signals being given by semaphores at each station, both a home and distant signal being used. The heads of departments are all Europeans, but most of the employes in all departments are natives.

While in Egypt we visited the Suez canal, and it is probably the most insignificant looking affair for the importance it really holds in the commerce of the world that there is in existence. The banks on both sides are nothing but sand piles, and extending back as far as the eye can reach in all directions there is nothing but a sandy desert, and I do not think it possible for any one who has never seen a sandy desert to form any conception of how utterly barren and desolate the surface of this earth can appear. The accompanying illustrations show typical views along the canal and also some of the excavating machinery which is constantly at work at many points. This work is done almost exclusively by endless chain bucket dredges of the English pattern, and in practically all cases the spoil is carried by an elevator to a hight sufficient to allow it to be discharged in a liquid state to a point outside the original bank. With this method there is no rehandling, although near the ports the spoil must be discharged into hopper bottom scows and towed out into the sea.

From the Suez we took a steamer to Colombo, Ceylon, and this country is, I think I can safely say, the most beautiful of any we visited, as flowers and all kinds of vegetation are probably found in such profusion in no other country in the world. The railway belongs to the government, and consists of about 270 miles of 5 ft. 6 in. gage track, the main line of which extends from Colombo to Bandarawella, a distance of about 160 miles. Between Colombo and Pattipola, a distance of 139 miles, the rise is between 6,000 and 7,000 ft.; the first 30 miles out of Colombo is very nearly level, and after passing over this section, which extends through a succession of rice fields and plantain groves, the base of the hills is reached, and from this on there is a succession of sharp curves, tunnels, bridges and heavy grades, surrounded by scenery of a grandeur not seen in many spots in the world. The prevailing grade is 1 in 44, the average speed of the train for the entire distance, including stops, is 14 miles per hour. The train that we went up on had some eight coaches of the Bogie type, and was drawn by a 10-wheel engine which would weigh probably 130,000 lbs. At many points we crawled along at a speed so slow that we could have jumped off the train and run along by its side. It is not uncommon to find a curve of 5 chains

*From a paper read before the Western Society of Engineers, December 4, 1895.

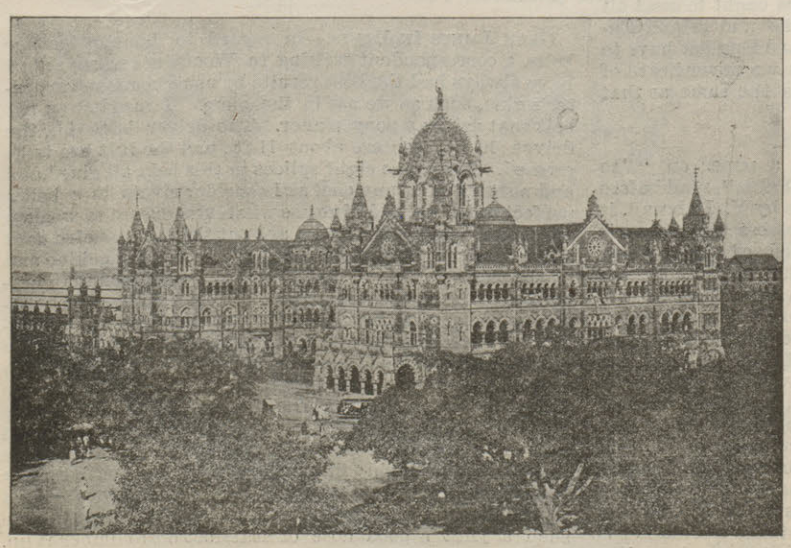


FIG. 3—BOMBAY STATION—GREAT INDIAN PENINSULAR RAILWAY.

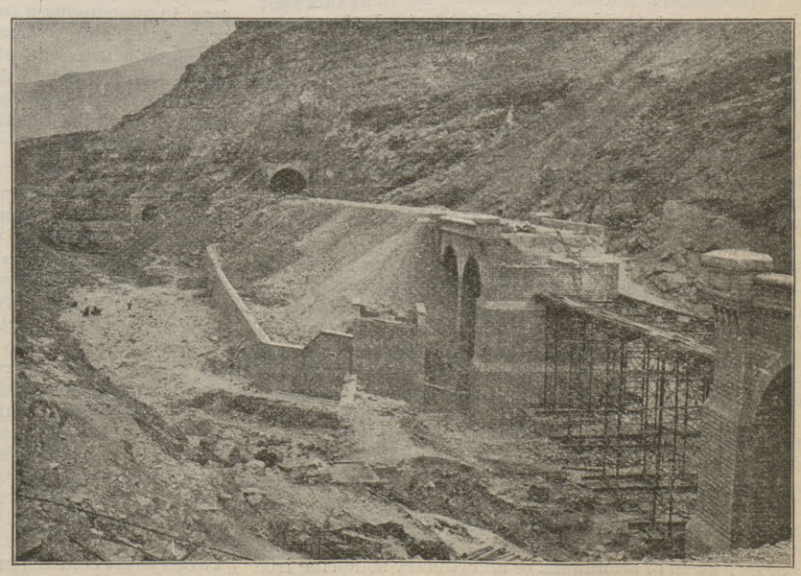


FIG. 5—BRIDGE IN BOULAN PASS—MUSKAF BOULAN RAILWAY.

radius on a grade of 1 in 25, which you know very well makes pretty heavy work for locomotives.

One of the most serious impediments in the way of good railroading in Ceylon is the heavy rainfall. We were shown one place where it was claimed 24 in. of rain had fallen in 24 hours, and in some parts of the island the yearly rainfall is upward of 300 in. This rainfall makes it necessary to construct heavy retaining walls at all cuts or fills, and even with these it is sometimes impossible to hold the roadbed in proper condition. The bridges must be very substantial and are built with heavy stone abutments and central piers of wrought-iron cylinders filled with concrete, sunk to a solid foundation. The original method employed in the building of the abutments is quite interesting. The stones used are quarried in the country and worked up by the natives. They are most of them of pretty good size and elephants were used exclusively for handling and placing them.

The ties used in the railway are wood and the rails of the T pattern, and were formerly fastened to the ties by bolts through the flanges; but it was found that the bolt holes were frequently starting points for cracks which which would result in broken rails, and therefore this method has been abandoned and spikes are now in general use. The ties are mostly of teak wood, which grows in abundance in Ceylon and makes a tie which, they claim in Ceylon and India, is much better than our oak. Some pressed-steel ties have been put in, but as they cost about $2.50 apiece laid down in Ceylon, and the teak can be had for 40 and 50 cents, it is poor economy to use them. The standard depth of ballast is 15 in., and three different types are used. One is broken stone, the second gravel and third, cabook, which is a laterite. Broken stone costs about 50 cents per cubic yard, and gravel and cabook 25 cents per cubic yard in the track. In some places ballast has been used to a depth of 3 ft. and over for leveling the track, because it was cheaper than to remove the ballast, fill in with earth and then replace the ballast. This sort of work is all done by native labor, and the track workman gets anywhere from 10 to 12½ cents a day, while 25 cents a day is very high pay for a foreman.

One of the most noticeable features in connection with the railways in both Ceylon and India is the fact that no crossing is left unprotected. At Kandy, which is one of the most important places on the road, the crossings are mostly elevated, and all other crossings throughout the country are protected by gates and watchmen. Trespassers are subject to fine and imprisonment, and if an animal, such as a cow or horse, is killed by a train, the owner is very careful not to let the railway officials dicover the correct ownership of the beast, for if they do he is subject to a heavy fine for allowing it to be on the right of way. The railway stations are handsome buildings, all excepting three being built of brick or stone and all of them are scrupulously clean. The grounds surrounding each station are decorated by beautiful flower gardens, and at a fixed date an inspection is made by the general manager and awards presented to the station master having the best kept grounds The platforms are built of cement and of such a hight that is a comfortable step from the car to the platform, or from the platform to the car. The English type of carriages and goods wagons have been used almost exclusively until within the past three or four years, when the American type of coach and freight car have been coming in.

Each station is supplied with a semaphore signal with a separate blade for trains running in each direction, and they are used only for giving stopping signals. The system of starting signals is somewhat complicated. When a train is ready to pull out, the stationmaster rings a hand-bell and the guard of the train then looks around and sees that everything is all ready and blows a small shrill whistle, and if the engineer is read, he toots the whistle of his locomotive, which is answered by a second whistle from the guard, and after these operations the train moves off. The natives of Ceylon are quite intelligent in the handling of the railways and are employed as station masters and in all positions of like character. All the clerical work about the office is done by them and also all the firing of locomotives, and a few are employed as drivers.

The climate of Ceylon is hard on paint, and near the seashore the bridges are usually painted every four months and never allowed to go longer than six. Black paint, coal-tar and pitch are used for this class of work.

The railway system of India, which was the next country visited, is much more extensive than supposed by persons who have not looked into the subject. At the present time there are in operation in this country something over 18,000 miles of railway, of which about 12,000 is 5 ft. 6 in. gage, 4,600 meter gage, and the remainder 2 ft. and 1 ft. 6 in. The 5 ft. 6 in. gage was the first introduced, but it was soon found that many roads could not be made to pay operating expenses, and it was decided to use the meter gage in building some new roads, and also to change the gage of some of that built 5 ft. 6 in. in order to lessen the expense of operation. The South India road is a notable example of the latter, as it was originally 40 to 50 miles long, and with a 5 ft. 6 in. gage, and did not pay expenses in the hands of a private company. The Indian government agreed to guarantee interest on the bonds of this road if the gage was changed to one meter and the line extended. This was done, and at the present time the road is doing a large business, and it is found that the meter gage is too narrow to carry it economically. This has occurred in one or two other places in India and in some places they have the meter gage where they should have the 5 ft. 6 in., and in other places they have the 5 ft. 6 in. and should have the meter, and I think the general opinion is that it was a great mistake that the 4 ft. 8½ in. gage was not originally adopted.

In the Bombay Presidency which is on the western coast the Great Indian Peninsula Railway, with 1,498 miles of track, is the most extensive road. The great feature of the G. I. P. Railroad, as it is called, is its switchback or reversing station, a short distance out of Bombay, which is a very fine piece of engineering work. The Bombay station is said to be the finest in the world, and the exterior probably is, but the interior is exceedingly disappointing. Almost any station in the city of Chicago would present a much finer interior appearance than this magnificent structure, as all the money has been spent on the exterior, which is quite characteristic of English railway stations. The illustration Fig. 3 is a very good view of this station.

From Bombay we took a steamer to Kurrachee and there struck the Northwestern Railway, which is the largest single system in India, and has 2,617 miles of line in operation. At Ruk Junction, about 250 miles north of Kurrachee, the Muskaf Boulan Railway branches off from the Northwestern and extends for a distance of about 300 miles through an exceedingly barren and desolate district across British Beloochistan to Chaman, just across the Afghanistan boundary, and forms the extreme western outpost of the British Indian government. This line was built and is maintained purely for military purposes and is probably one of the most interesting in the world. It was built under the supervision of Sir James Brown, 213 miles being completed in 33 months, 42,000 men being at work under the protection of a body of 5,000 troops. The line passes through a desert 50 miles wide, and during the work all food and water were carried on camels for long distances. As the line was nearing completion cholera broke out among the men, and 3,000 of them mostly natives, died within one month. From Sibi north the line was originally built through the Boulan Pass and laid on the bed of the river. For several years it was kept open with only occasional breaks of small moment, caused by heavy rains. It was found, however, that what appeared to be a more feasible route for the line from Sibi to Bostan was through Chuppa Rift, and what has since been given the name of Mud Gorge. The line was accordingly laid on this route, the distance between the two points being 133 miles. Mud Gorge, however, developed unlooked for difficulties, as it was found that the earth was of such an unstable character that the line was unsafe. On several occasions sections of it shifted 10 or 15 ft. in one night and no amount of retaining wall or piling could be made to hold it in place. While attemps were being made to overcome this difficulty, in August, 1890, a cloudburst completely wrecked the line through Boulan Pass. At just about this time it was decided that

FIG. 6—BRIDGE IN BOULAN PASS—MUSKAF BOULAN RAILWAY.

FIG. 7—TRACK LAYERS OF THE MUSKAF BOULAN RAILWAY.

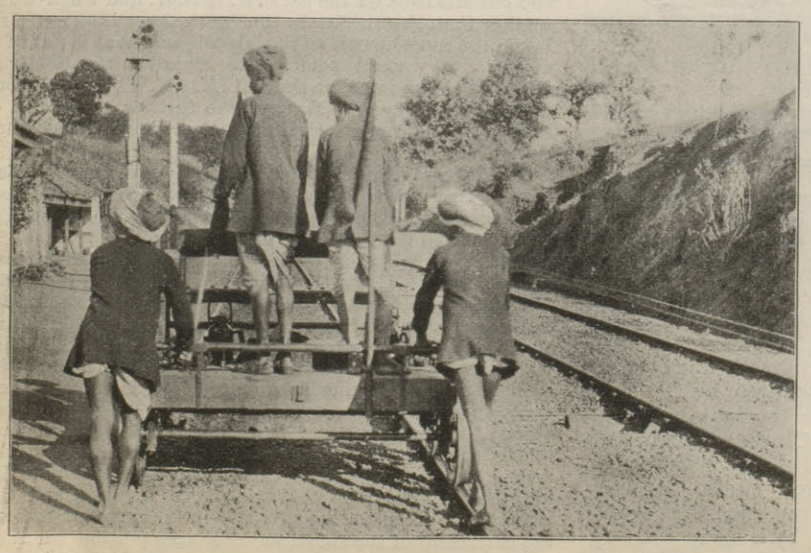


FIG. 8.—PUSH CAR AND COOLIES—INDIAN RAILWAY.

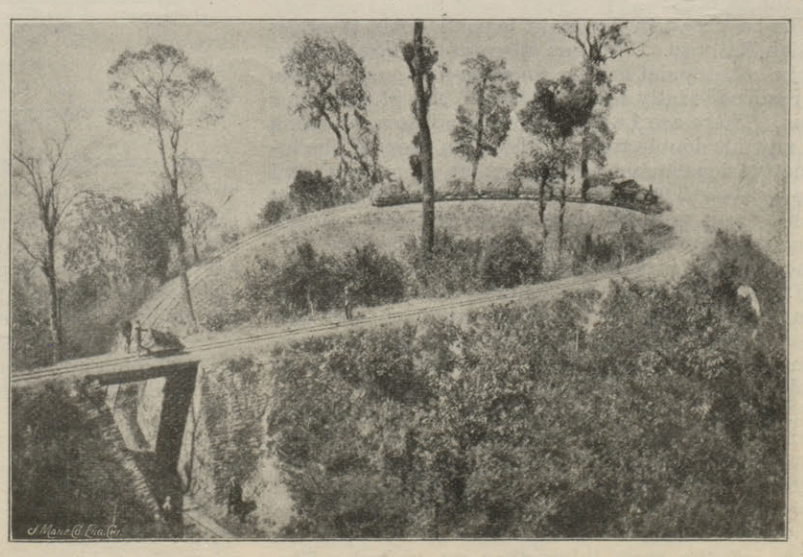


FIG. 9.—SPIRAL 60 FT. RADIUS ON THE DARJEELING HIMALAYAN RY, INDIA

the line could not be maintained through Mud Gorge and the only possible course was that of reconstructing the line through Boulan Pass.

Chuppa Rift, which must thus unfortunately be abandoned, is a remarkable freak of nature. The hill through which it passes is an enormous ridge of rock and the rift is a split or crack, varying in width from 10 ft. up to 300 or 400 ft., and looks as though it had been caused by the earth's surface being strained beyond its elastic limit. The railway approaches the rift through a long tunnel, crosses it over a bridge shown in illustration, Fig. 4, and immediately enters another tunnel. In its course through the rift, a distance of about three miles, there are several short tunnels and bridges.

The reconstruction of the line through Boulan Pass was begun in November, 1891, was well under way when we were there, and it was expected that it would be opened for traffic about the first of January next. This is probably the heaviest piece of railway construction in existence and the accompanying illustrations, Fig. 5 and 6, will give some idea of the bridges. It is a double track of 5 ft. 6 in. gage, the distance between centers being 14 ft., the weight of the rail 100 lbs. per yard, the sleepers of pressed steel weighing 160 lbs. each, and the prevailing grade 1 in 24. In one five miles there are fourteen bridges upwards of 60 ft. in length, and the cost of that section was $58,000 per mile.

Beyond the pass the road crosses the summit of the range through the Kojak tunnel, and while its dimensions may be familiar to some of you, I will give a few of the most important. The length of the tunnel is 12,800 ft. and the radius of the arch is 14 ft. 6 in. above the center and 29 ft. below. Half of it is level and the other half is on grade of 1 in 40. It passes through the shale rock and about three-fourths of it had to be timbered in building. It is lined throughout in brick, usually five rings thick, although in some places there are only four, and in others six and seven. There are two tracks 5 ft. 6 in. gage, 12 ft. between centers, and the difference in the portal levels is 150 ft. The work was begun in April, 1888, and the tunnel opened for traffic January 1, 1892, 114 ft. driven in one week being the best record. The work was carried on from both sides, a track of 5 ft. 6 in. gage being constructed over the top of the mountain for the purpose of carrying the material through to the further side. When the tunnel was built two shafts 14 ft. square were put in for the purpose of ventilating, but the scheme was a failure, as the tunnel remained full of smoke. Finally the shafts were closed as an experiment and the smoke immediately cleared out, and since that time there has been no difficulty with ventilation.

The illustration, Fig. 7, gives a good idea of the appearance of the laborers on the railways in Beloochistan and northern India, and also shows the manner in which they operate a shovel. They have very little strength in their arms, their muscles all being in their legs. A shovel filled with ballast is more than one man cares to manipulate, and consequently one man pushes the shovel under the ballast and another, by means of a rope attached near the lower end of the handle, drags the load along. The division of labor seems to do very well and the men will manage to handle a reasonable amount of ballast if given sufficient time.

One of the great features of the railways of India and Ceylon is what they call the trolley car. The natives, having no strength in their arms, are not able to pump our hand cars, but they can get on the rails behind a car and push it at a speed of ten miles an hour on the level, one man running on each rail, as shown in the illustration, Fig. 8. A good brake is put on each car, and when a grade is reached it is let loose. We went down through the Kojak tunnel and into Chaman on one of these cars at a speed of between 35 and 40 miles an hour, and a more exciting ride I never had.

All the bridges on the Muskaf Boulan Railway and also the Kojak tunnel have a fort at each end where guns can be mounted, and as we were winding along through the mountains it was a common thing to see sentinel towers on top of the high points commanding the railway.

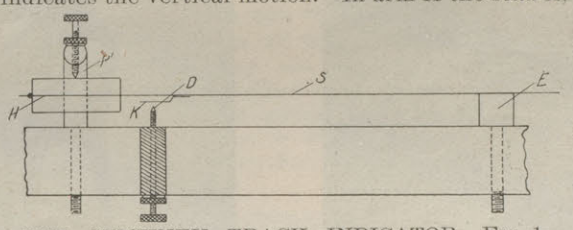
The best road in India is beyond doubt the East Indian Railway. This line operates the fastest train in the country and has the finest motive power, while its roadbed is fully equal to that of any of the other lines. There are 1,843 miles in the system, of which 474 miles is double track The main shops of the locomotive department are located at Jamalpore and employ about 5,000 men. The only rolling mill in the country is a part of these shops and in it a large amount of scrap iron is worked into merchant bar, some of which is used by the road and the remainder sold. A complete system of semaphore signals is being put in at all small stations, which consists of a home, distant and starting signal for trains going in both directions. At the large and important stations interlocking plants are being installed.

From Calcutta we went up to Darjeeling, the great summer resort in the Himalayan mountains, and the nearest point to Calcutta where cool weather is to be found. We took the Bengal State Railway from Calcutta to the foot of the mountain range, and there we took the Darjeeling Himalayan Railway, which is one of the most interesting we visited. The gage is 20 inches, the road is 50 miles in length, and in that 50 miles the rise is over 8,000 feet. We left the foot of the mountain in summer clothing and sweltering with heat at 8 o'clock in the morning, and at 3 o'clock in the afternoon we had to wrap our steamer rugs around us and nearly perished then with the cold. There are four spiral curves on the line similar to the one shown in Fig. 9, the radius of which is 60 ft., and also six or seven switchbacks. The rainfall in this section is heavy and some extensive retaining walls are necessary for preventing washouts.

(To be continued.)

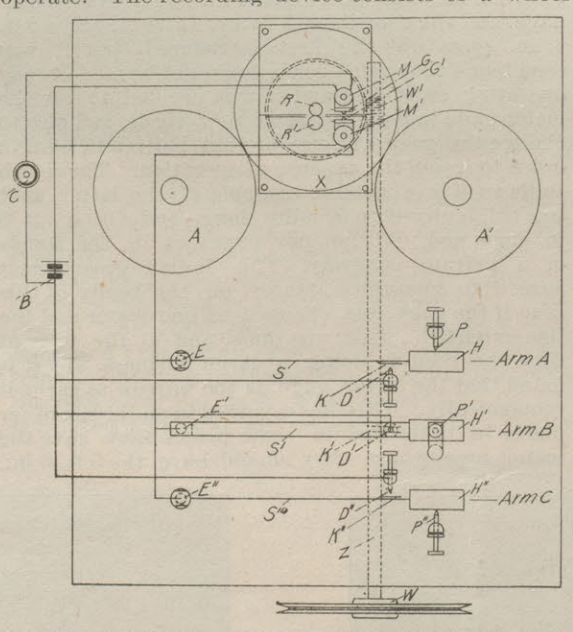
THE STICKNEY TRACK INDICATOR.

A simple form of automatic track indicating apparatus has been devised by Mr. Charles A. Stickney of St. Paul, Minn., and is in use upon the Chicago Great Western Railroad. The object of this apparatus is to obtain an automatic record of uneven spots in the surface of track or sharp defects in the alignment. The chief features in the construction of the apparatus are shown in the accompanying diagrams. Fig. 1 shows the arrangement of one of the springs of the receiving device. Fig. 2 is a diagram of the whole machine and the electric circuits employed. The receiving part of the apparatus consists of three arms, A, B and C. Of these arms A and C are used to test the lateral motion, and arm B indicates the vertical motion. In arm A the stud E, best shown in Fig. 1, is fixed to the frame and a light flat spring extends from one side of it lengthwise of the car and terminates in the hammer head H. This hammer head is adjusted to a certain tension against the stop P. The stop D is adjusted in such a way as to allow the spring K to come in contact with it if the head H is withdrawn a short distance from the stop P. In the arm C the stops D and P are reversed. Arm B has the same features as the others, except that the stop P is placed above H^1 and the stop D^1 is placed below K^1.



THE STICKNEY TRACK INDICATOR.—FIG. 1.

The operation of these arms is as follows: The indicator is placed upon the floor of the car with the arms parallel to the rails, and when the car is run over the road the lurches caused by unevenness in the track operate the springs to close electric contacts. If the car makes a lurch in one direction the hammer head H is thrown away from the stop P, making the spring K come into contact with the stop D. This closes the circuit of the electro magnet M^1, which registers a mark upon a strip of paper held between the guides J J. If the car makes a lurch in the opposite direction the arm C closes a second circuit and violent vertical motion causes the arm B to operate: The recording device consists of a wheel W, driven by a belt from the axle of the car. This gives motion to the roller R and the disc X. The disc X turns the spools A A^1 by friction in such manner that a ribbon of paper wound upon one of them and passing between the rollers R R^1, is given motion upon a definite scale corresponding to the distance passed over by the train. When starting upon an inspection a reference mark is made upon the paper by the point G, which is operated by the push button C. The claim made for the indicator after several months of use upon the Chicago Great Western Railroad is that it is simple, effective and cheap, and that it will locate all the low joints. It is attached to a regular coach and run upon the regular trains, where it can be operated by a comparatively inexperienced person. It is used to locate the rough spots in the track in a similar way to that employed in the elaborate apparatus of the dynagraph car with which our readers are familiar.



THE STICKNEY TRACK INDICATOR.—FIG. 2.

SWITCH INDICATORS.

At the January meeting of the Railway Signaling Club the discussion upon the paper read by Mr. Salmon at the December meeting on the subject of switch indicators, was in substance as follows:

Mr. Miles (M. C. R. R.) The two general questions that enter into this discussion are: First, in regard to the audible or visible indicators; second, in regard to the different functions of the indicator as used on the different roads.

I think that if the audible indicator were as reliable as the visible indicator, that it should be used in preference, on account of the greater likelihood of it being observed by the trainmen. But as the failure of the contact of an audible indicator, or the breaking of a wire, would give a false indication, and as this would not occur with the visible signal indicator, I think the latter preferable. The method used on the Michigan Central Road developed from the use of an electric signal for working an insolated switch, the indicator being used to tell the position of the signal and for no other purpose.

When the question of using indicators on switches was brought up in connection with block signals, the Mich. Cent. took the stand that the indicator should not only indicate the approaching train, but should indicate the position of the signal after the switch had been thrown. The first circuit designed for this was complicated and expensive, four wires being required to run to the farthest switch. But since that application another circuit has been designed which only requires two wires to be run beyond the overlap of the block, and with the latter circuit I believe the installation can be put in cheaper than any other system of indication, at least where there are a number of switches that are not close together in the block. Under the system used on the Chicago & Northwestern. the Illinois Central and the Kansas City, Fort Scott & Memphis roads, it is necessary to separate the track sections at the switches, and if there are several switches in the block and not close enough together to have the group come in one circuit, the expense of the relays and extra batteries is considerable. The circuit put in on the St. Louis, Keokuk & Northwestern I believe is as simple as the new circuit designed for the Mich. Cent., but with the circuit applied on the St. L., K. & N. W. road they get the same indication from the train in the block that they do on the Mich. Cent. road, still they do not get the indication of the position of the signal, and if this can be covered without any extra cost, it seems well enough to use it.

It might be said in favor of the system used on the C. & N. W. road, that if a train were beyond the switch in a block section, and another train desired to come out between the train that was on the main track and the signal, that the switchmen would have an indication of the approach of another train, while on the system as applied either on the Mich. Cent. or on the St. L., K. & N. W. he would have no such indication, but if there was a signal on the main track beyond the switch, the signal would be at danger, and the approaching train would necessarily be going slow. While it may be said in favor of the Mich. Cent. system that if the switch was thrown and the signal did not go to danger for some reason, the switching train could be protected by flagging.

In regard to the system as used on the Ill. Cent., it is lacking I think, in not having a preliminary indication.

Mr. Elliott (C. M. & St. P.) There are two different uses which are made of the indicator and which in practical results are very different. In one case on the C. & N. W. the indicator is cleared immediately after the train passes the switch, or group of switches, in the other case, (on the St. L., K. & N. W.) the indicator does not clear until the train has passed out of the block. Each of these mean entirely different usage of the signals for spacing trains. In the first instance, if the indicator clears as soon as the train has passed the switch, any train in the side track wishing to go out on the main line can proceed immediately; there is no blocking, it can follow out anytime that the trainmen please, unless by the rules there must be a time interval. In the other case, the block system is maintained absolute. I think the plan used on the St. L., K. & W. R. R. is much the safer.

Mr. Miles—The circuit of the Mich. Cent. and that of the St.L.K. & N.W.are practically the same, except that the Mich. Cent. has better protection. When the switches are inside the preliminary of the block there are simply two wires being used through the overlap, one extra wire for the indicator, one common wire and one other wire for the indicator and the signal. That is as simple as the circuits used on the St. L. K. & N.W. and when we go farther than the overlap in the block there is an extra relay in the same circuit as the signal, and that is put in to cover a very small point. The circuit is practically as cheap as the one used on the St.L. K. &N.W., and with one exception, as simple. You get the further protection of knowing when your block is at clear or safety, which they do not.

Mr. Wilson (The Hall Signal Co.)—I see that Mr. Salmon's paper takes it for granted that switch indicators are necessary. The question seems to be as to the kind of indicator and the best mode of operating it.

The visual indicator works on the correct principle of signals, that is, if anything happens to any of the parts, the indicator shows danger which is correct. I think that with the proper devices for connecting the audible signal, that it can be worked as safely as the visual, and it has some virtues which should be respected. Although the visual signal is coming into general use I am not myself quite prepared to lay the bell on the shelf and say it is a thing of the past, because with your visual signal you are dependent altogether on one man. One man goes to the switch and looks at the indicator, but with the audible signal, the engineer, the brakeman, the fireman, and the whole train crew can hear it. When the switch is thrown the movement of the signal to the danger position whether that movement is up or down, causes the bell to ring, or

causes the visual signal to show danger. In that case, suppose we have a failure, the switch is thrown, the bell fails to ring, there is some trouble and the train cannot go out. You have a light on your signal, if the light goes out there is no light, similarly if the bell fails to ring it is a danger signal, therefore I think the bell can be made to operate as safely as the visual signal, and I think it should be further considered before it is laid away.

In regard to the circuit mentioned in the paper, the Mich. Cent. folks say that they want an indicator that will announce the approach of a train when the switch is set for the main, when the switch is thrown for the siding or crossover, they want that indicator to show the position of the signal. I say they do not ask for much, they are very modest in their request. They want one indicator to play the part of two. In order to do that which they require, there must be two separate and distinct circuits for that indicator. One must run directly back of the preliminary section in order to set the indicators when the train approaches. Now the clearing of the switch must break up that circuit and set up a new one that runs only from the signal through a circuit on the instrument and through the indicator, cutting out the preliminary section entirely.

Now this circuit closer on the instrument which has been referred to is merely a spring set immediately under the shaft on which the signal turns, and a little cam is attached to the shaft. When the movement of the signal swings the little cam off the spring and allows it to open or to close as required, that circuit changes, so the use of this circuit closer on the signal instrument requires no extra wire or battery.

In regard to the cost of installation, the more simple circuit, the last one that Mr. Miles spoke about, is accomplished by only one or two wires and is of less expense than that of the C. & N. W., because they go to the expense of connecting every track with the indicators and also running their signal wires to the last switch. To install the C. & N. W. system would cost about 20 per cent more than the last indicator spoken about, and the circuit already in, which is referred to in the paper, cost about 50 per cent more.

Mr. Elliott—I would like to ask what is the additional cost of putting in a set of indicators over the simple block system, according to the plan which Mr. Miles uses?

Mr. Wilson—The cost will vary greatly according to the position or location of the switch with regard to the signal. On an average it will cost somewhere about $90. It costs about 15 or 20 per cent of the cost of installing a signal. I have very recently figured on one switch which would cost $275 for one indicator.

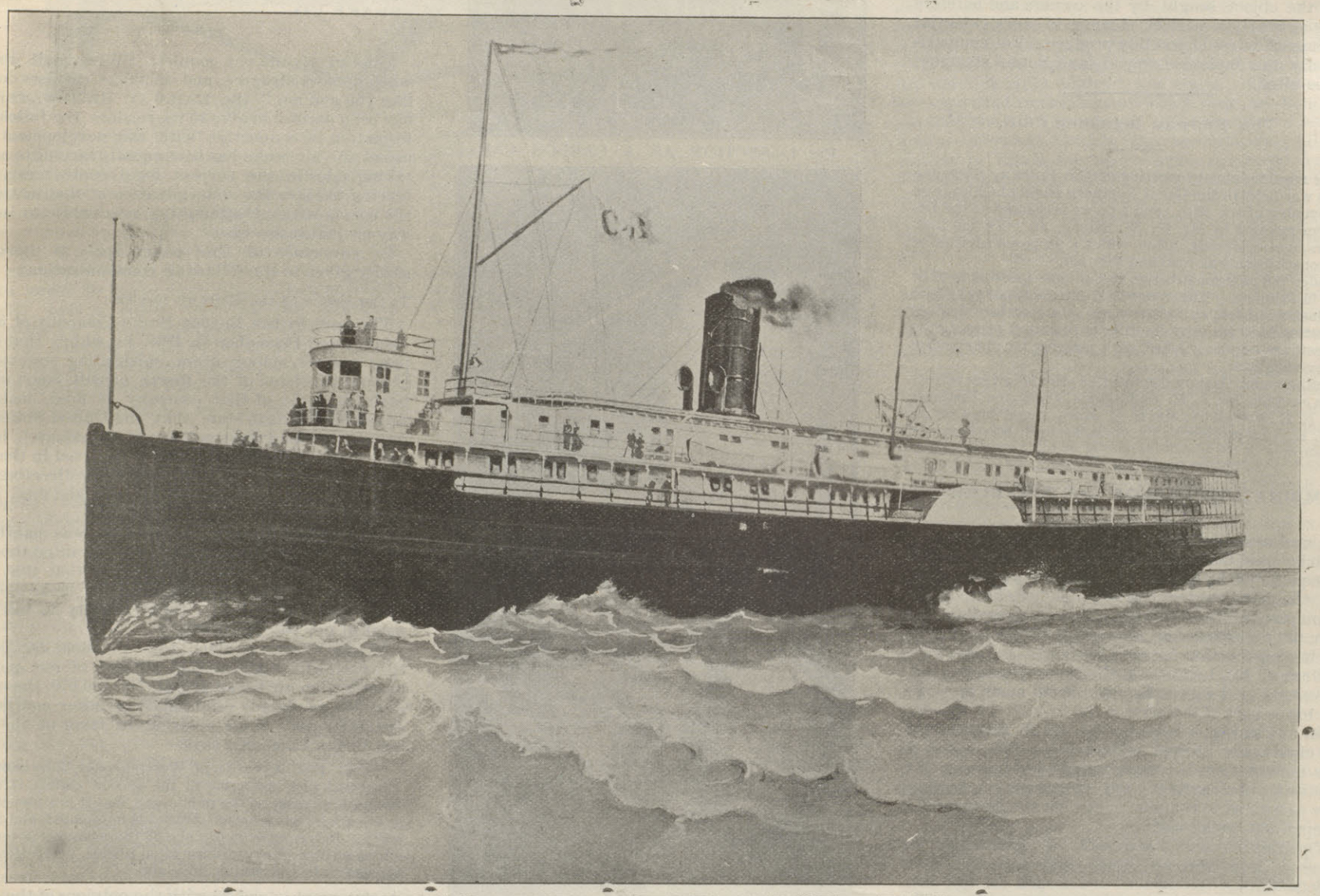
The president—I should like to make reference to the application on the Ill. Cent. of the audible indicators. At the time this installation was made, just prior to the world's fair, the intention was to run foreign engines over the terminal tracks in and out of the Jackson park terminal. It was thought at that time that the audible indicators would serve the purpose very much better than the visual signals would, from the fact that the crews of foreign roads would have their attention immediately arrested by the sounding of the bell, whereas the visual indicators of course would be of no purpose unless the crews knew that such things existed.

So far as the reliability of the indicators is concerned, I think they are quite as reliable as the signals are, in fact, if anything, more so. As installed on the Ill. Cent., the indicators in 90 per cent of the circuits get their battery from the signal. That is, when the signal assumes the danger position the battery is thrown onto the switch indicators and it can be very readily seen, if the signal is out of order by reason of grounded track or anything of that sort, the battery is thrown on your indicator and your indicator bell sounds. So far as the experience of the Ill. Cent. road is concerned in the use of these audible indicators, I do not hesitate to say that the results are as good as can be expected and that they are as reliable as any other system of indicators might be.

Mr. Elliott—The bells must work on an open circuit. The consequence is if any part of the circuit breaks or gives way, the bell would not ring and practically give you a clear signal. Mr. Wilson's objections overcome that, in that if trainmen are instructed to listen for the bell, and if it did not ring would know it was out of order. Any new man coming on and not knowing that, would think there was a clear signal and I think in view of that the visual signal is a practical necessity if absolute safety is required. The bell of course is additional safety, or at least an additional advantage, but I should not think that anything more than a visual signal would be required.

The President—The objections to the points that Mr. Elliott brings out are theoretical entirely. My remarks are based on actual results from audible indicators. Now, while it is true that the visual indicators are theoretically correct in the arrangement of the circuits, the actual results obtained by the use of the audible indicators are, or has been quite as good as any other system that might be used. I am satisfied of that.

In 1894 the average signal failures on our road was a fraction over seven per month, and I do not think that we have had that many failures on the bells. I think we have something like 315,000 signal movements per month. We have 128 signals, so the percentage of failures is very small.



STEAMER "CITY OF BUFFALO".—LARGEST SIDE-WHEEL PASSENGER STEAMER ON THE LAKES.

NEW SIDE WHEEL STEAMER, "CITY OF BUFFALO."

Through the courtesy of Mr. T. F. Newman, general manager of the Cleveland & Buffalo Transit Co. we are enabled to illustrate the new side wheel steamer "City of Buffalo," which was built for that company by the Detroit Dry Dock Co., and launched at the Wyandotte ship yards on December 24, 1895. The designer was Mr. Frank E. Kirby of the Detroit Dry Dock Co., and this is one of two steamer which are to run daily between Cleveland and Buffalo. The owners of this boat had made up their minds from their three years' experience upon this route that to meet all the requirements the boat must be somewhat different from any now in that service. She is a side wheeler, but can hardly be compared with any of that class of steamers now on the lakes, except that in general appearance she somewhat resembles the D. & C. steamer "City of Mackinac," except that she is much larger, as the following figures will show.

The length on the water line is 298 ft., and length over all 308 ft. The breadth over hull is 41 ft. and over all 75 ft. The depth of hull amidships 17 ft. 4 in. Draft, light 9 ft. 6 in., and loaded, 11 ft. 6 in. The shell is of steel $\frac{3}{8}$ of an inch thick increased to $\frac{1}{2}$ in. at the keel. It is stiffened by belt frames and forward and aft bulb iron. There are eleven water tight compartments, arranged as follows: Collision compartments, crew's quarters, dynamo room, boiler room, engine room, galley, dining room, and quarters for steward's crew. The necessary communications between the compartments is had by means of automatic water tight doors operated from the deck above. The coal bunkers are placed athwart ships, forward and aft of the boilers, and have a capacity of 350 tons. The boilers, six in number, are of the Scotch type, each 12 ft. 6 in. in diameter by 12 ft. in length, and are made of $\frac{15}{16}$ in. steel under the United States requirements. Each boiler has two furnaces. The boilers are tested to 175 lbs. under the government inspection and will be allowed a working pressure of 125 lbs. The weight of the boilers is 250 tons, and when filled with water the entire battery will weigh 500 tons. The Howden hot draft system will be applied, and this was selected with a view of obtaining a uniform pressure of steam under all conditions, and on account of the opportunities which is offers for the saving of fuel. The boat has one elliptical smoke stack 7 x 9 ft. in section and 65 ft. high.

The wheels are of the Clyde feathering type, 30 ft. 6 in. diameter, and when set up complete weigh 58 tons each. Every part is made to be interchangeable. Each and every part will fit in any place in either wheel. The bushings are all of bronze, instead of lignumvitae as formerly used. By the perfection of these wheels all lost motion will be overcome, and the jar usually experienced from the motion of the wheels reduced to a minimum. The main shafts are 29 ft. long, 24 in. in diameter, and weigh 18½ tons each, and were forged by the Cleveland City Forge & Iron Co.

The main engines were built by the W. & A. Fletcher Co. of New York. They are of the compound beam type with high pressure cylinder 50x96 in., and the low pressure cylinder is 80 in. diameter, with a stroke of 12 ft. The valve gear is the Sickle's cut-off which will cut off at any desired point of the stroke. A pressure feed water heater is provided with capacity sufficient to condense the steam from all of the engines, 16 in number, and heat the water to a high temperature before feeding it into the boilers. In order to obtain a comparative idea of the power of these engines, it may be stated that no steamer of this class on the lakes has a cylinder exceeding 68 in. in diameter, and the owners say that the "City of Buffalo" has 50 per cent more power than the largest steamer of her class on the lakes. The electric lighting plant includes apparatus for the operation of 2000 lamps, beside a powerful search light. This equipment is very complete as is also the annunciator apparatus.

The main deck as far aft as the passenger gangway is exclusively for freight, and will stow 800 tons of general merchandise. The social hall is immediately aft of this and is the first appartment entered by the passenger. It is finished in light

mahogony, highly carved, and decorated. Adjoining this room are the offices of the purser and steward, and the baggage room. At the stern is a spacious day cabin, adjoining which are two cozy private dining rooms for the accommodation of private parties. The dining saloon is reached by a stairway from the social hall and is finished in oak with highly artistic decorations. It will seat 150 people. The cook's galley occupies a compartment just forward of the dining saloon, and is well fitted up. The grand saloon is 250 ft. long and contains two tiers of state rooms around which is a broad gallery. The lower deck of the saloon is finished in solid dark mahogany with artistic designs of pressed leather panelings. The gallery is treated in delicate tints and gold tracings. The furniture was designed specially and harmonizes with its surroundings. There are 160 commodious state rooms, beside six special parlors with bath and every modern convenience. In addition to these accommodations 150 single berths are provided, making the entire sleeping capacity in berths sufficient for 640 people.

As the "City of Buffalo" represents the best type of side wheel steamer thus far constructed on the lakes, it is a pleasure to illustrate and describe her. The cost of this boat has been a secondary consideration, the object sought by the owners and builders being as nearly a perfect steamer in every essential detail as they could possibly produce. For comparison only the famous Long Island Sound steamers can be cited.

The Railway Signaling Club.

The regular January meeting of the Railway Signaling Club was held in the Great Northern Hotel of Chicago on the evening of the 28th, and a paper presented at the December meeting by Mr. W. W. Salmon, on "Switch Indicators, was discussed, after which a proposed revision of the constitution was read and adopted.

Under the new constitution the annual meeting is to be held in January. The number of meetings per year is to five instead of ten, as formerly, and the membership dues are raised to $3 per year, in order to permit of printing the proceedings regularly after each meeting for distribution among members.

Acting under the new constitution, the following officers were elected: Mr. J. W. Gillingham, Jr., signal Engineer I. C. R. R., president; Mr. H. D. Miles, signal engineer M. C. R. R., vice president; Mr. G. M. Basford, secretary and treasurer.

COMBINATION PARLOR CAR AND SLEEPER.

A new design of sleeping car which is so arranged as to be used during the day time as a parlor car has been patented by Mr. L. D. Ruth, of Connellsville, Pa., the principal features of which are shown in the accompanying illustrations. These engravings are from photographs of an incomplete private car during its construction for the Pittsburgh & Lake Erie Railroad. Fig. 1 shows a section as arranged as a parlor car. Fig. 2 shows the upper berth made up while the lower part of the section is in use, in the day time, and in Fig. 3 both berths are in position and the chairs are stowed underneath. The object of this arrangement is to save weight and improve the conditions of cleanliness and sanitation of sleeping cars as well as to combine in one car the features of a sleeper and parlor car.

The cushions and mattresses are inflated by air pressure from the air brake system served by a special storage tank placed under each car and controlled by three way cocks at each section. The mattresses are made like the bag of an accordion, the folds of which are drawn together by springs which are stretched by the inflation and cause the bag to collapse when the air is let out. To guide the head and foot of the mattress and support it when extended, it is provided with a series of hooks that catch over the transverse steel frame supports. These supports at the outer ends are connected at right angles to vertical posts or standards and at their ends next to the car sides they are hinged so as to fold in a horizontal plane and lie flat against the sides of the car when the berths are not in use. The berths are folded in a housing or casing in the sides of the car, and when it is desired to extend them for use, air is turned on by opening one of the valves. These parts are shown in Figs. 1 and 3. The air causes the mattresses to be inflated and extended moving laterally across the guides and supports. When the cushions are inflated, their communication with the air pipe is cut off. The mattress at its outer edge is connected to the panel rail which moves in and out with the mattress. This connection is made at the bottom of the rail so as to prevent the weight of the occupant from tearing the mattress away.

Each section has two chairs mounted upon box bases in which the bedding is stored. The chairs turn upon swivels through which the air pipe passes to the cushion. The chair back frame is hinged to the base frame and folds forward whenever the cushions are emptied of air. The arm is secured by a button to the back and is hinged to the base so as to fold inwardly over the seat, and it is rigidly held upright by a bolt when the chair is arranged for occupancy. Designs are also completed for the employment of the regular double seat as now employed. This plan would do away with the swivel connection to the seat cushions used with the chairs. The sections of the car are separated by partition curtains for the upper and for the lower berth, arranged upon vertical spring rollers at the side. They are composed of woven wire covered with cloth to give substantial protection, and are pulled out horizontally when distended. The construction admits of placing ventilators in the sides of the car above the upper berths, thereby rendering them more comfortable in hot weather. Any one berth can be arranged for sleeping while the rest of the car is used for a parlor car, or an upper berth can be extended while the chairs are in use below it as shown in Fig. 2. Where cars having this improvement are detached from the train the maintenance of the air pressure is provided for by a separate air pump carried by each car and worked by hand. It is to be feared that there may be some practical difficulties with the arrangement of chair seat cushions if used as described. In these illustrations no upholstery is shown, the photographs having been taken before the completion of the construction.

FIG. 1.—SECTION AS A PARLOR CAR.

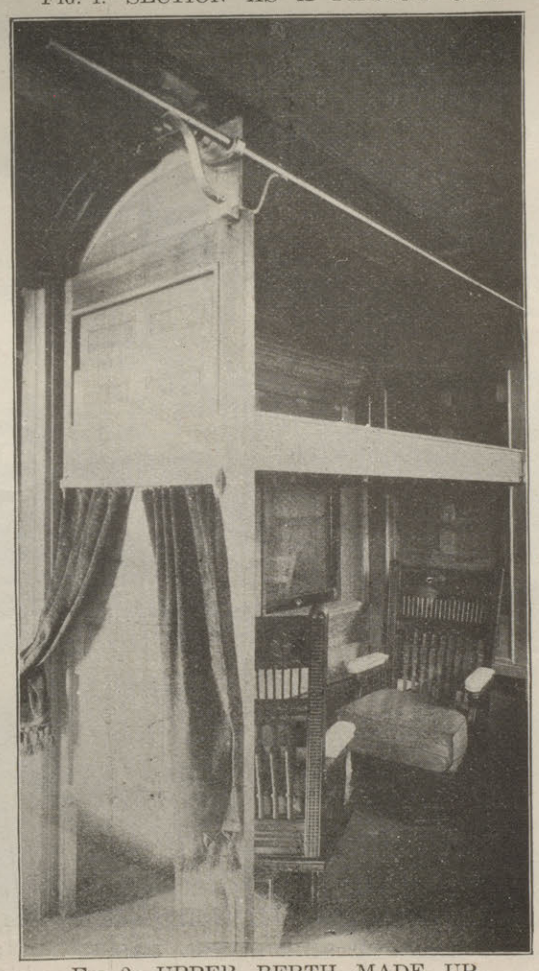


FIG. 2.—UPPER BERTH MADE UP.

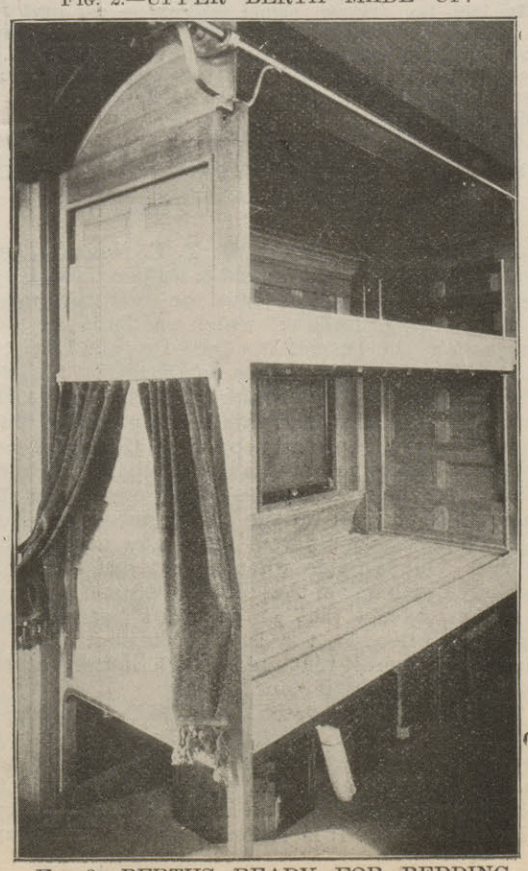


FIG. 3.—BERTHS READY FOR BEDDING.

AIR BRAKE LITIGATION -- THE WESTINGHOUSE AIR BRAKE CO. VS. THE BOYDEN BRAKE CO.

Mindful of the old couplet; "Who shall decide when doctors disagree, and soundest casuists doubt, like you and me," the RAILWAY REVIEW, while it has been careful to give to its readers the fullest information in connection with the development and use of the air brake has been equally careful to avoid taking sides in the current legal controversy, preferring to leave the determination of that matter to the courts without attempting meanwhile to in any way prejudice the case.

In pursuance of this policy, space is therefore gladly given to the following communication:

To the Editor of the Railway Review:

The issue by the Boyden Brake Company of a circular, dated December 31, 1895, in which that company asserts, among other misleading statements, that the decision of the fourth circuit court of appeals in favor of that company is final. makes it necessary for us to state that the United States supreme court has, upon petition of our counsel, based upon a few of the serious errors involved in that decision, granted a writ of certiorari directing the case to be sent up to it for revision and final judgment.

The Boyden Company's statement was manifestly prepared before the supreme court granted the writ of certiorari, and it will thus be seen that that company is not yet finally authorized to make and sell quick-action air brakes without liability for infringement of our patent rights.

We have never doubted that the final decision in this case will reaffirm the validity of our pioneer quick-action air brake patent (No. 360,070, the one in dispute), as already established in other courts; for Judge Hughes, in his decision in favor of the Boyden Brake Company, says:

> "That this invention of Westinghouse, thus undefined (the court then referring to the second claim), is one of the highest value to the public, and that it is a pioneer one in the art of quick-action brakes is not denied, and is conceded. It is conspicuously one of those pioneer inventions which entitle the proprietor to a liberal protection from the courts in construing the claim."

A statement in accord with the opinions of the other courts which have, in each instance, conceded and affirmed the pioneership and value of this invention.

In each of three previous decisions in favor of this patent, the second claim has been upheld and has not, in any manner, been held to be insufficient, even in any technical sense, to fully cover the invention; and we therefore the more strongly feel that our confidencc in the ultimate determination of this litigation in our favor is well founded.

The Boyden Brake Company has issued an illustration and description of a new form of quick action triple valve, which it states was subjected to a satisfactory rack test at Altoona, by the air brake committee of the Master Car Builders' Association. This new valve has not hitherto been the subject of litigation under our patents and has never, to our knowledge, been commercially used or tested. We believe that the construction of this valve comes clearly within the claims of one of our patents, and we have promptly brought suit against the Boyden Company to restrain that company from making and selling this new valve.

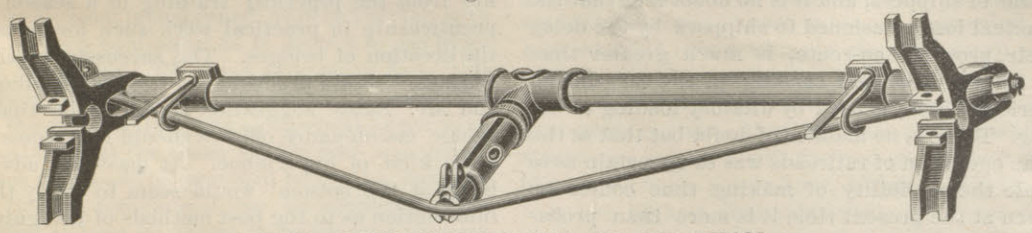
It will not be out of place to call attention to the fact that railway companies have, in numerous instances, been misled by the statements of various parties manufacturing brakes, in infringement of our rights, and the loss inflicted upon those who have purchased brake apparatus in reliance upon those statements has already been very great. We feel convinced that we are fully justified in believing that our patents fully cover all of the forms of quick action brakes which have so far been offered for sale, and that the courts will finally so decide.

THE WESTINGHOUSE AIR BRAKE CO.,
H. H WESTINGHOUSE, General Manager.
Pittsburgh, Pa., Feb. 1, 1896.

THE INTERCHANGEABLE BRAKE BEAM.

Interchangeable is the name given to a new metal brake beam which is being manufactured in St. Louis, Mo., and which it is claimed will soon be specified on a large number of cars. The general appearance of the beam is shown in the accompanying illustration, from which it will be seen that the compression member or back strut is circular in form. One of the principal claims made by the manufacturers is in that this member has the strongest possible form per pound of metal and also that the material used, high carbon steel, is more suitable than any other for withstanding the strains to which it is subjected. These members are not welded but are rolled into tubular form. The heads are of malleable iron and being cast from the same pattern there are no rights and lefts. The truss rod passes through the head and a bevel washer which has a bearing on both the head and back strut holding them firmly in their proper relative positions.

The strut is reversible but is made in only two pieces so the truss rod must be slackened for changing a beam from right to left or vice versa. This it is claimed is much better than the practice of making the strut in three pieces as when the latter is done an indirect pull on the lever will cause the strut to turn and cause the lever to bind. A rigid strut is applied when desired. The Interchangeable Brake Beam Co., of St. Louis, which manufactures this beam has been working on the design for some time and in order to make sure that it had sufficient strength had a beam tested in the Washington University testing laboratory. The report of the test as received by Mr. F. B. Aglar, president of the company is given below together with comments thereon by Mr. Edward Flad, C. E.



THE INTERCHANGEABLE BRAKE BEAM.

TEST OF INTERCHANGEABLE FREIGHT BRAKE BEAM.

Washington University Testing Laboratory, January 4, 1896.

Diameter of back strut, 2.41 in.
Diameter of tie rod, 1.00 in.
Weight of back strut, 20 lbs., 13 oz.

Applied loads at center. Total lbs.	Deflections at center. Inches.	Micrometer readings. Inches.
0	0.0	1.529
2,000	0.012	1.517
4,000	0.020	1.509
6,000	0.039	1.490
7,500	0.049	1.477
8,000	0.052	1.460
10,000	0.069	1.444
12,000	0.085	1.432
16,000	0.097	1.412
18,000	0.117	1.315
20,000	0.214	1.180
21,720	0.349	
*27,660		

*Beam broke through failure of tie rod, which broke in threads. Back strut did not fail.

J. B. JOHNSON,
Prof. Civil Eng. Washington University,
Mgr. Washington University Testing Lab.

I was present at the above test and observed the results. The deflection of the brake beam, as indicated above, was only 0.049 in. for a load of 7,500 lbs., or 20 per cent less than the allowable deflection, which is 0.0625 in., or 1-16 in. The ultimate strength of the beam was 27,660 lbs., or more than three times the required strength.

EDWARD C. FLAD, C. E.

Engineers' Club of Philadelphia.

At the annual meeting of this club held January 4, Mr. Geo. S. Webster, retiring president, presented as his annual address a paper reviewing the progress which has been made in the various branches of engineering during the year 1895, giving details of conspicuous examples of advanced practice. Statistics were given of the amount of railroad construction during the year, and especially of the work done by the Pennsylvania Railroad Company and the Philadelphia & Reading Company. The increase in the speed of locomotives was commented upon, data of the best recorded runs being given. Progress in locomotive building was reviewed and some conspicuous examples were described. The advancement in street railway construction, especially the rapid substitution of electricity for other motive powers thereon, was noted, also the necessity of avoiding crossing steam railroads at grade, brought about by the increase of speed through cities, and the consequent work that has been done by the Pennsylvania Railroad Company to avoid such crossings in the principle cities through which it passes; while the construction of a subway and a tunnel through the heart of this city for the abolition of grade crossings on the main line of the Philadelphia & Reading Railroad was described in detail.

Under transmission of power the generation of electricity from water power at Niagara, and it transmission from there to the city of Buffalo, was alluded to, and the suggestion to use the power which may be generated at the lower terminus of the Chicago drainage canal, at Lockport, also the plan to supply electricity at Salt Lake City from Big Cottonwood creek, about 14 miles away, were spoken of. It is believed that the difficulties of transmitting power in the form of electric current are being rapidly overcome, so that in the near future we may expect by this means, the transmission of a great force to distant points for utilization.

Ship building was next considered, and the statement made that the product of American ship building during the last year has been a convincing demonstration of the capacity of America to efficiently build ships of any style and type, either mercantile or naval, that any nation may require. The vessels and machinery built at our great shipyards on the Delaware were described in considerable detail, and the character of the representative vessels from the different nations assembled at the opening of the Baltic canal was commented upon.

In bridge construction long and heavy structures across the wide rivers have become usual occurences. Among important structures completed during the past year, Mr. Webster cited the bridge over the Missouri river, at Sioux City, the Louisville and Jeffersonville bridge, the steel arch bridge now under construction across the Niagara river, to have a span of 840 ft., the double track railroad bridge nearing completion across the Delaware river, and the highway bridge recently completed by this city across the Schuylkill river at the falls.

High buildings were then touched upon and the erection of 13½ stories of the iron work for the Fischer building in Chicago in fourteen days was cited as the record for rapid construction, and the subject of waterways was next considered.

Probably as an outgrowth of the convention of the International Deep Waterway Association, the president of this country has appointed a deep waterway commission, to confer with a similar body appointed by Great Britain or Canada, as to the feasibility of constructing a waterway capable of transporting ocean steamers from the Great Lakes to the Atlantic. Mention was made of the intention to utilize, together with the Illinois and Mississippi rivers, the main drainage canal of the sanitary district of the Chicago, from the south channel of the Chicago river to Lockport, as a free ship channel navigable for boats of 22 ft. draft. The cross-section of this canal is greater than that of either the Suez, Manchester or North sea canals. From the report of the Nicaragua Canal Commission recently published, it appears that new and exhaustive surveys are considered necessary before sufficient data will be at hand to make any conclusive estimates and reports upon the final location. The report practically condemns the present location from Greyton to Brito, or at least suggests many marked departures from the plan proposed, and increases the estimated cost of the canal to nearly twice as much as the company's figures. Projected work on the deepening of the Erie and Oswego canals, the deepening of the Champlain canal, and the construction of a canal from Pittsburgh to Lake Erie were briefly described, and the work which has been done in deepening and rectifying the channel in the Delaware and Schuylkill rivers at Philadelphia was explained in considerable detail.

The increased responsibility which now rests upon the engineer on account of the increase in the magnitude of the work in almost all branches of the profession, makes it necessary that systematic engineering inspection should be exercised in all important contracts. The engineer can no longer afford to isolate himself from his brothers in the profession, but must constantly keep in touch with what others are doing by comparing methods and results; and in order that intelligent comparisons may be made, it is absolutely necessary to establish uniform methods of determining the strength and other properties of materials and the efficiency of mechanical work. Some important tests have been made by the United States government at Watertown and by the National Societies of Mechanical Civil and Mining Engineers. Most of our larger institutions of learning have established physical laboratories as necessary adjuncts to their technical schools. More complete data, however, are still needed regarding the composition of good preservatives for iron and steel in building construction, and for the proper composition and quality of material entering in all classes of municipal work, electrical and other causes of underground deterioration.

The field of the engineer has, within the past few years, assumed such vast proportions that the individual engineer has necessarily become a specialist, yet he is frequently called upon to design and execute works of magnitude which require special knowledge in a number of branches, and in order to utilize to advantage the rapidly accumulating information which is at hand, he must have a full knowledge of the conditions under which this information was obtained. The engineering society affords that opportunity, and opens the door to a free interchange of ideas and experience.

The presentation of original and descriptive papers upon engineering subjects, and the full and thorough discussion which generally follows, develop interesting facts and indicates the latest and best practice, and these are the means of constantly keeping the profession acquainted with the progress and discoveries that are being made in every field.

In closing, Mr. Webster acknowledged the kind support given him as president by the board of directors and the individual members, and also his indebtedness to members of the profession, whom he enumerated, for valuable information used in his paper.

The election of officers resulted as follows: President, A. Falkenau; vice president, Carl Hering; treasurer, George T. Gwilliam; secretary, L. F. Rondinella; Directors, Max Livingston, Joseph T. Richards, L. Y. Schermerhorn.

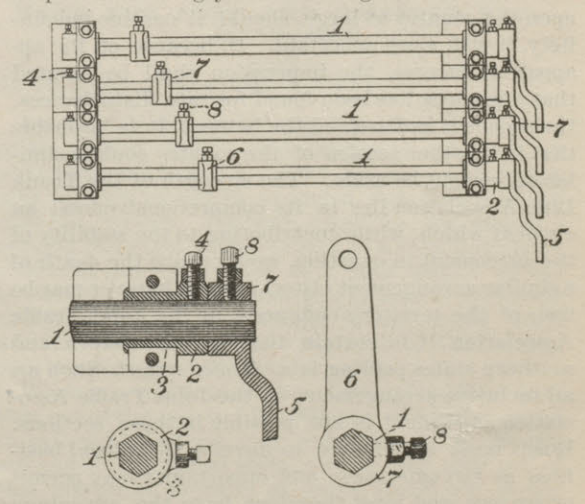
The new president, Mr. A. Falkenau, took the chair, and made a short and appropriate address. He stated that after eight years' membership in the club, there was no place in Philadelphia where he felt more at home. Its influence on the development and on the individuality of its members as broad engineers he considered very powerful, and the opportunity which it affords for social contact and knowledge of a different side of human nature from that exhibited in the course of business, is mutually helpful. In this combination of social and scientific purposes its function is wider than that of the national societies, and of consequently greater personal benefit. The information obtained in casual conversation is often quite as valuable as that which comes from the formal reading of papers, and the advantage to younger men of hearing the results of the wider experience of those older in the profession is very great. Through this improvement of its individual members, the club also exercises an important influence on the community at large. It has already gained large proportions, and is capable of still greater development if every member will do his share to help as he is able. Mr. Falkenau expressed the honor which he felt in being elected to the presidency of the club, and in promising to devote his best efforts to further its interests, he asked the cooperation and help of every member.

ROCKER SHAFT LEAD OUT.

In the construction of interlocking plants one of the most important items is to obtain a secure and strong connection at the tower, where the vertical throw of the lever tails is transformed into longitudinal motion for the lead out lines which run to the switches, locks and signals. The most satisfactory method of transforming this motion is by means of what are termed rocking shafts which extend across the tower at right angles to the track. The shafts are supported in bearings by which they are held in parallel lines at 5 in. centers. The shafts in a set of four are shown in plan in the accompanying illustration in which the short arms numbered 5 are attached to the lever tails by the up and down rods. The connections from the rocking shafts to the work are made by means of the straight cranks, arranged along the shafts at the left of the illustration at such spaces as will give the proper spacing to the pipes.

These shafts were formerly made of round iron to which the arms or cranks were welded in such positions relative to the length of the shaft as is required for the conditions of the work. These welds were made in the shop, and as the parts are large it was found to be difficult to change them as occasion required on the work either in construction or in altering old plants. To remedy this difficulty the Union Switch & Signal Co., has introduced the form of shafts shown in these illustrations. The shafts numbered 1, in the drawing are cold rolled to a hexagonal section and cut off at the required length in the shop before going out upon the work. The design includes an arrangement of sleeves whereby all tooling of the shafts for obtaining the bearings is avoided. The sleeves shown at 3 are cored out to fit the hexagon of the shafts and are turned up on the outside to fit the bearings which are provided with caps held down by cap screws. The sleeves are held in position upon the shafts by means of the set screws numbered 4. The shafts are set up in position and the sleeves put into position when holes are drilled into the shafts into which the set screws are turned.

The cranks, both the straight ones for the pipe lines and those offset for the lever connections, are provided with sockets of ample dimensions which are adapted to fit snugly on the hexagon shafts and are held securely in position by the set screws shown at 8. These set screws are locked by jam nuts and they do not become loose. The whole design is made with reference to strength and convenience in construction and in carrying out alterations. The durability of the parts is ample proof of the efficiency of the arrangement. Difficulty might be anticipated on account of the possible non-uniformity of the rolling of the shafts, but we are informed that there is no trouble on that account and that no faults have developed in service covering several years. These shafts are no more expensive than the welded ones and they are reported to be stiffer and stronger, owing to the large amount of material left in the eyes of the cranks and also to the cold rolling process to which the shafts are subjected. This arrangement was designed and patented by Mr. Vibe Spicer, signal engineer and western agent of the Union Switch & Signal Co.



HEXAGONAL ROCKER SHAFTS.

THE RAILWAY REVIEW

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CHICAGO, SATURDAY, FEB. 8, 1896.

THE slight reaction in the iron trade in the direction of greater activity and higher prices has drawn attention to the possibility of a rushing demand for early spring requirements. Large orders for rails, shapes, plates, rods, billets, Bessemer and bar iron during the past few days serve to warn consumers against the mistake of too long delay. The sickening experience of last year which sent prices skyward will not be repeated. Railroad requirements are looming up. Car and bridge material is under negotiation. Steel makers shut down the instant orders are filled. Pig iron makers are doing the same thing. These are good symptoms. The dullness is suspicious, and conditions point to a sudden breaking out of demand. The government's necessities for money have made enterprise move slowly. Bank clearings have been reduced. The air brakes will soon be released and in all probability a surprisingly large volume of business will crowd in on the industries for spring and summer requirements. There is occasion for encouragement.

SOMEWHAT more than thirty days have passed since the Joint Traffic Association became operative, and yet no approach to a break in the ranks has been disclosed. It is true that rumors have not been wanting and that the columns of the daily press have been full of statements to the effect that the association was in imminent danger of dissolution, but the facts are that at no time during the past five years has there been less friction in the rate situation between the Mississippi and the seaboard than during the past thirty days. How long this condition of things will remain is problematical, and what the effect upon the country at large, should it contine indefinitely, is still more uncertain. If, because of its apapparent success, the impression shall be created that a panacea has been found for rate disturbances, the sooner it is dissolved the better. It is probable that in no other section of the country could a similar agreement be made. The strength of the Trunk Line Association lies in its comprehensiveness; an element which, while contributing to the stability of the agreement in question, would prove the death of a similar arrangement elsewhere. Whatever may be true of the territory embraced in the Joint Traffic Association it is certain that in the western and southern states pooling is a *dernier ressort*. Such an all inclusive arrangement as the Joint Traffic Association agreement is not possible in these sections. Roads must be left free to develop their local business as circumstances and opportunity may permit or require, and must therefore have the advantage of an arrangement elastic enough to permit individual management of local traffic while exerting a definite control of competitive business. If, therefore, the success of the Joint Traffic Association shall create any very general impression that legalized pooling is not a necessary adjunct to the successful operation of the act to regulate commerce it will, as already stated, be a misfortune to the country at large that it was ever successfully inaugurated.

THE Cincinnati Grain, Hay and Feed Receivers' Association is agitating the question of reciprocal demurrage. In common with many other shippers throughout the country they protest against what they consider a "jug handle" arrangement. As they put it they are required to pay car-service for all time over forty-eight hours consumed in loading or unloading cars, but on the other hand when a railway company requires several days to place a car in position no claim for loss or damage to the shipper occasioned by such delay will be entertained. They claim that the rule should be reciprocal in its character, and on the same theory that they are required to pay for delays occasioned by misfortune or carelessness, the railroad company should in like manner reimburse them for delays arising from similar causes. It must be admitted that in this matter the shippers have the best of the argument, although the fact should also be stated that car service rules as at present enforced are not wholly in the interests of the railroads. The more rapid handling of cars possible under efficient car service regulations is directly a benefit to shippers as well as to railways; but it is nevertheless true that the rules of car service associations are not altogether founded in equity. Taken in the aggregate the unavoidable delays attaching to railroad operation, are probably not greater than those which interfere with the plans of shippers, and it is no doubt true that the total actual loss occasioned to shippers by the delay of their property en-route, is much greater than would be the probable earnings of the cars during the period of delay caused by dilatory loading or unloading. There is no manner of doubt but that at the first the operation of railroads was so uncertain as to preclude the possibility of making time contracts; and even at the present time it is more than probable that what would seem an extravagant margin might be necessary to the adoption of such conditions. But after all is said it remains true that as at present formulated, car service rules are unfair, and therefore should be reconsidered. It is not believed that these rules should be abrogated, for even under their present form they are an improvement upon the old system, but the railroads cannot afford to maintain, much less defend a system which is so manifestly wrong as that now in force throughout the country. That the principal underlying these charges for delay is correct, has been affirmed by the courts, but it would be better for the roads if they would voluntarily establish a corresponding allowance to shippers for delays occasioned by themselves, instead of compelling their patrons to resort to the courts in order to maintain their rights, as surely will be the case unless this is done.

ENGINEERS AND RAILWAY MAINTENANCE.

Elsewhere in this issue will be found the first part of an address recently delivered by Mr. Onward Bates to a body of the students at Purdue University. The space is gladly given to these words of advice, information and opinion as to the best methods for handling the important department in charge of bridges and buildings, coming as it does from a man of such wide and successful experience. All persons may not at once agree with the author in some of his ideas, yet they are all good and are worthy of consideration and thought if not at once accepted. Certainly a man who is capable of properly locating a line of railway must be acquainted with the conditions which will surround and govern its operation, for it is necesssary in order to locate well that he be fully up on the requirements of maintenance and operation. It is not, however, common to find a man who could fill the position of chief engineer under such an arrangement as is proposed by Mr. Bates. The difficulty will be to obtain an education and experience in practical work sufficiently broad to qualify for such an office, and with this must also be coupled business ability of high order. Yet the office of chief of maintenance should unquestionably be an engineer, and there might be considerably less backlash if one man were held responsible for the maintenance of the entire machine. The man who would be broad enough to fairly treat matters of location, track and bridge construction, also designs and necessarily operation of locomotives, as well as the construction of buildings and the equipment of shops, would be an ideal which does not exist to any extent at the present time. Conditions may change so that this may be done in the future and if so there seems to be no good reason why department lines might not be broken down somewhat by such a plan. Too much attention is now given to the boundaries of departments, which to a great extent tends to blind the members of each department to the fact that there is but one object for the road to pursue and there is a tendency toward attempts to make personal records. We hear of roads upon which the safety of structures and of track has been endangered for the purpose of enabling certain officers to show good records for their divisions. Good records are most desirable, but they are only truly good when secured without sacrifices in other departments.

This might easily lead to a fruitless discussion of the respective merits and qualifications of engineers of different branches to govern each other, but no such result is aimed at by the writer of the paper, who deplores the fact that as a rule engineers have not the training necessary to qualify them for executive work. The men properly prepared for keeping up maintenance are rare and ability to manage men seems to be the crying need. At the present time many roads place the care of track and even of bridges in the hands of operating men for the reason that they excel in emergency and executive ability. Such roads might not at once transfer this responsibility even if engineers were on hand prepared to assume absolute charge of it, but there can be no doubt of the avisability of putting the entire responsibility of such work upon engineers when a sufficient number of them are prepared to assume it.

The advice to begin at the bottom is good and there is every reason to believe that men commonly known as "civil engineers" would reap great benefits from the practical training of a season of apprenticeship in practical work such for instance as the erection of bridges. The successful mechanical engineers obtain practical experience from shop work and Mr. Bates' suggestion seems to be that good bridge maintenance officers should have some of the same kind of experience. At least the advice "to begin at the bottom" would seem to imply this and information as to the best methods of designing will be greatly broadened by putting the future designer through a course of study as to how the structures designed by other men are to be put together and to be maintained in safe condition. The mechanical draftsman who has no knowledge of foundry methods is likely to cause considerable trouble in the handling of patterns and cores and the designing of such a casting as a locomotive cylinder would not be intrusted to him. It is a question whether all civil engineers who are educating themselves for railroad construction and maintenance should not be given a training in such shop methods as are found absolutely necessary to the preparation of men in the so-called mechanical pursuits, and would they not be well repaid for the time which a regular course in shop work would take? It is said that of all men civil engineers must be specialists. Yes, but they will be better specialists in any line if they know about the simple methods employed in the construction of the elements which they are called upon to use. There are other comments to be made upon the portion of Mr. Bates' address, which will appear in a later issue, and these will be reserved. The author has given these students some ideas which will be found valuable for men of large experience as well, and this opportunity is taken to commend the practice of bringing men of experience before undergraduates in this way.

THE TIME LIMIT OF THE SAFETY APPLIANCE LAW.

Although without definite announcement, and in the utter absence of any reliable authority, there appears to be a very general impression abroad that railway managers are anticipating an extension of the time allowed for the equipment of cars with automatic couplers, and are governing themselves accordingly. How such an impression could obtain general currency in the entire absence of all warrant, is a mystery; and how railway managers, who are, of all men, least likely to be affected by rumor, can attach any importance to such a statement is still more strange. As the moving cause of such action rumor assigns the incomplete state of coupler development, the litigation attending same, and the financial condition of the railroads which makes the requirement contemplated by law too burdensome to be arbitrarily exacted. These alleged facts, and the leniency manifested by the Interstate Commerce Commission in connection with grab irons seem to be relied upon as furnishing ample reason for the relief that the time limit of the law in connection with couplers will not be strictly enforced. It may be well, therefore, to examine this matter in order to ascertain if the idea referred to has any foundation in fact.

As to the present state of the development of the car coupler it must be admitted that it is, as yet, incomplete, but so is every other appliance used in connection with railways. In the entire range of railway construction, there is perhaps no one thing as yet accepted as perfect. Nor has the fact that any article which railroads desire to use was imperfect, ever been considered as a bar to its application, if only it was an improvement upon existing methods, or promised a reasonable return on the required investment. If through the adoption of any device, operation was made more economical, or revenue increased, the fact that the thing desired was not fully

developed cut no figure. It is true that into such consideration the question of money saved or money earned enters; whereas, in connection with couplers it is yet a question as to whether net earnings will be augmented by their adoption. But that is not the only question that should be considered as controlling in this connection. It is sure that the saving to human life and limb will be greatly promoted by the adoption of automatic couplers, under in their present state of development, a fact that is alone sufficient to warrant their immediate adoption even in the absence of any requirement of the law.

The financial argument urged by the objectors to the legal requirement, although of more force, is hardly more valid. By the enactment of the law the performance of interstate transportation subsequent to January 1, 1898, is conditioned upon the equipment with automatic couplers of all cars employed therein; and of such condition five years notice was given. A railroad therefore has the option of confining its operation wholly within state lines so far as its own equipment is coneerned, or of complying with the law on such equipment as it desires to use in interstate commerce. To plead exemption from this option because of financial stringency is somewhat akin to the position taken by a steamboat owner who, when notified that the boiler of his boat was unsafe and a new one must be provided before he could be given a license, complained that he could not afford it, and that at least he ought to be allowed to run a little longer with the present one in order to earn money enough to buy a new boiler. The reply of the inspector was terse and to the point: "If you can't put in a new boiler sell your boat to some one who can. There is no law compelling you to run the boat."

The third objection, namely, the litigation threatened in connection with couplers is less worthy of consideration than the other two. There are a sufficient number of manufacturers of couplers whose guarantee is ample to protect all purchasers, and who stand ready to defend at their own cost all suits of rival makers. It would appear, therefore, that all three of the objections are altogether inadequate to account for the disposition on the part of some railroad companies to delay action in this important subject.

It is probable that the real reason underlying this inaction is a belief that the Interstate Commerce Commission having the power, will extend the required time according to the necessities of the case as they may appear on the first of January, 1898; and from one point of view it must be confessed that there is some ground for such a belief That tribunal has on various occasions manifested a great degree of leniency in its administration of the law. Appreciating the difficulties under which railroads are operated, and believing that in a large majority of instances railway officials desire to comply with the law, it has been ready to listen to and accept all reasonable excuse for non-compliance with the statute, and where a time limit was desired to extend it if possible. But this attitude of the commission should not be taken advantage of nor construed as indicating that in the question of couplers a similar practice will be followed. The commission is fully advised as to the conditions attending this question. In the matter of grab irons it recognized the ambiguous phraseology of the law, and the efforts that have been made by the railroads to arrive at uniformity in connection with this appliance, and therefore felt justified in granting further time. But no such excuse can be pleaded in connection with automatic couplers. The question resolves itself simply into one of purchase and application, and it is doubtful if the commission will feel itself authorized to extend the time prescribed in the law, because of the alleged inability of any railroad to buy these appliances; much less for any of the other reasons referred to.

INTERNAL COMBUSTION ENGINES.

In considering methods for the distribution of power, electricity is almost instinctively turned to as an elastic and easily managed medium. For this purpose compressed air also has in certain cases excellent qualifications, among which perhaps the most prominent is the fact that it may be stored within certain limits ready for use whenever wanted. It is not discrediting the special advantages possessed by either compressed air or electricity as a means for distributing power to suggest that for some purposes, and in fact a great many kinds of power service, a proper consideration may not have been given to another method of distribution having qualifications which are worthy of consideration, namely, internal combustion engine, in which either gas or oil is used as a power producer. The purpose of this presentation of the subject is to call attention to the wide adaptability of these engines for a line of work in which they have not yet been to any extent applied, namely, the distribution of power about shops and shop grounds. The very fact that fifty thousand gas engines are in use at the present time is sufficient evidence that this form of power is one which must be reckoned with in the future.

The explanation of this wide development as to numbers is in the availability and convenience in use of this motor as compared with steam engines. Many mechanical engineers of this country have not considered gas engines as practical machines for power production because many of the experimental engines have been of small sizes, but recently engines of three hundred, four hundred and even six hundred horse power have been constructed which together with an economical performance that cannot be approached by the steam engine firmly established, the rivalry of what in general terms may be called the gas engine. A properly constructed gas engine of even moderate size will convert so large a proportion of the heat supplied into work as to place the smaller units of this power upon a higher plane of economy than that occupied by the best types of multiple expansion steam engines. Putting this in figures, while the steam uses at best about one and one-quarter pounds of coal per horse power-hour, which is held by many to be the highest limit obtainable for steam, gas engines are now operating regularly with producer gas at a cost of seven-eighths of a pound of coal for the same unit, and a horse power for three-quarters of a pound is promised. The advantage which the gas engine now possesses is that without doubt the maximum possible efficiency has not yet been attained. This small difference in favor of the gas engine would probably not figure heavily in deciding between the two powers, but taken with the convenience of the gas engine and the important simplicity of its application, it is rendered worthy of consideration in cases where steam pipes would require extension for adding to a steam engine plant and where the generating as well as motor machinery would have to be increased in case of an addition to an electric installation.

One of the best recommendations for the gas engines lies in the fact that it may be stopped at any time and costs nothing except the interest on the investment when idle, and also the minimum amount of power producing machinery is thrown out of use when the engine is not running. That is to say, with the motor and generator in one machine, an advantage is obtained over electrical distribution of power on account of the necessity in the latter system of having a portion of the generating plant idle simultaneously with the motor. It is not necessary here to enter into a discussion of the relative merits of the gas and oil or gasoline engines except to point out that oil and gasoline engines need have no permanent connection with a source of fuel supply. Among the criticisms which have in the past been in many cases properly made with reference to the gas engine were unmechanical design and difficulty in starting. These, however, have been overcome by many builders to such an extent as to render the gas engine of the present day practically free from objections upon these scores, and the machine as it is at presented to-day is a practical one which will, without doubt, improve upon acquaintance. The recent discussion of gas engines before the members of the American Society of Mechanical Engineers in New York has done, perhaps, more than any thing else to induce engineers of this country to investigate the subject, and it is interesting to note that the comments upon this discussion by English engineers indicated considerable surprise at the ignorance which was expressed in the questions which were asked concerning gas engines by some of the most prominent members of the society referred to, and an English journal remarks that if these questions indicate the point attained by the American Society of Mechanical Engineers in the study of the subject, that it would be a good thing to send some of the members to that island to pursue their investigations. Mr. Dugald Clerk, estimates that there are twenty thousand of these engines in use in the United Kingdom, and as this is about two-fifths of the total number in operation, as far as numbers are concerned the Englishmen have a right to a certain feeling of superiority, and we in this country have not a creditable showing to make in this line.

Among the many uses to which this form of power has been put are a number of comparatively unimportant ones, and this may perhaps account for the exceedingly low estimate which is placed by many upon the usefulness of these engines. It will be out of place here to suggest specific lines for development, but it seems proper to say that experience abroad indicates that almost without exception gas engines may be employed in place of those driven by steam, and with equally satisfactory results. An example which illustrates as well as any that could be mentioned, the amount of saving which may be effected is the employment of gas or oil engines for swinging drawbridges. The expense stops in this case when the bridge is in position, either opened or closed, which is an advantage over either electric or steam power, both of which require the constant readiness of a steam plant. There are many uses about railway repair shops where the same advantages would be appreciated, among which are the operation of cold saws, coal hoists, transfer tables, shears and punches and similar machinery which may be scattered about the works and about the buildings. But that much more important service is also contemplated in this country for the use of gas is indicated by the fact that Mr. George Westinghouse has interested himself in this form of power as shown by his remark to President Roberts of the Pennsylvania Railroad during a visit of the latter gentleman to the Westinghouse works near Pittsburgh. We have already quoted a portion of these remarks but the following will bear repetition, "The Pennsylvania Railroad to-day, it is said, consumes about five million tons of coal per annum on its lines east of Pittsburgh, taking approximately twenty loaded trains each day for the transportation and consequently the return of twenty empty trains and requiring for the service of the company alone three million cars and a proportionate number of locomotives. If this power was to be generated by gas engines, only about one-eighth or six hundred thousand tons per year would be required, effecting a saving of over four million tons of coal, now costing the railway company about five million dollars, a saving which would justify a large enough capital expenditure to cover the complete equipment of the railway." The following from the late Professor Fleeming Jenkin which is quoted by Mr. Dugald Clrk in the concluding paragraph in his book upon the gas engine is also appropriate here. "Since theory shows that it is possible to increase the efficiency of the actual gas engine two or even three fold, then the conclusion seems irresistable, that gas engines will ultimately supplant the steam engine. The steam engine has been improved nearly as far as possible, but the internal combustion gas engine can undoubtedly be greatly improved, and must command a brilliant future.

There seems to be no doubt of the brilliancy of outlook and engineers when they realize the merits of this form of engine will not be slow to avail themselves of the advantage which it offiers. At present these advantages are not understood in this country but there are indications that it will not be long before gas engines will cut an important figure in estimates for power plants even of a considerable size.

HOME FOR AGED AND DISABLED RAILROAD MEN.

To the Editor of the Railway Review:

I was much interested and instructed in reading of Mr. Alfred Dolge's experiments as set forth in your issue of January 4. I can see no good reason why his plan cannot be extended and perfected all over the country. Railway employes are virtually serving the great public—hence in a very wide sense public servants for whom this same public should be not only willing but in some way lead to contribute to a fund that will be available to the family when accident cuts off or disables the head of the family, or when old age unfits him for work.

When one comes to realize this astounding fact, that out of the nearly 1,000,000 men who are engaged in railroad industries, only some 250,000 to 300,000 are engaged in actual train service and that out of this number an average of about 30,000 are either killed or more or less crippled every year, in this service for the public, certainly it does seem that this public who are served so faithfully by these men and at such a fearful cost of life and limb, cannot refuse to be willing to be taxed a small fraction of one per cent more for freight charges, so the companies can afford to set apart one per cent of the amount of the sum total of wages paid to the employes, as a pension fund for these men.

This move of Mr. Dolge is in the right direction for many reasons, one of the most obvious, besides that of pension, is the harmony and good will it would and must create between men and officials. It would be the ushering in of the day when strikes among railroad men would be a thing of the past. I am fully aware of the benefit feature that several roads have adopted for the good of the men in case of sickness, accident or death, but all have this very serious, and to my mind, fatal objection. The benefit fund is a sort of an involuntary tax upon the men

themselves. In a certain sense it is compulsory. It should not come out of the men. It should come out of the public. As is pretty well known I am and always have been opposed to this everlasting demand by certain ones for legislative power to reduce rate charges. It is better for all that reasonable rates be maintained, and I would sooner vote for a minimum limit than for a maximum. But I am wandering from the heading of this article. I wanted to state some facts that may be news to many of our readers that would go to show the absolute necessity of some such plan as that of Mr. Dolge's being adopted.

The writer has the unique honor of standing at the head of an association incorporated under the laws of Illinois which sustains the only place in all this our United America where destitute, aged and disabled railroad men can find a free and comfortable home. This home is supported entirely by contributions from railroad employes. It is now located at Highland Park, Ills., 23 miles north of Chicago on the Chicago & Northwestern Railroad. We have been in existence a little over five years. We have had between 25 and 30 different inmates. About 50 per cent of the inmates are afflicted with locomotor ataxia or paralysis.

Young men who become incapable for further work in train service and who have time enough left to learn some light trade or business education, we take care of freely while learning such and then assist them when possible to secure a place. Five have been so educated and are now in employment or running a business of their own, made possible by means of the home. Applications for admission to the home are now coming in so fast as the fact of the home becomes more generally known—we are compelled to begin to plan for greater accomdations. We feel we must have not only a large but practically a fire-proof building, as so many of the inmates, judging from present and past experience, fully one-half, will be paralyzed men and in case of fire might perish.

If you will pardon me, Mr. Editor, I would suggest that it might be interesting as well as profitable to the REVIEW and its readers if you should send a reporter up to the home with a kodak that you might see how comfortable those poor helpless men are in this home sustained by the contributions from their brother railroad men. This home is managed by a board of directors, more than half of whom are old railroad men who give their time freely when needed. The first inmate of the home was taken out of the Cook county poorhouse and cared for by the home until he learned the jeweler's trade and is now doing a living business in Chicago. Of course, we may be and in one sense are "a day of small things." We realized that we must creep before we could walk. Our aim has been to keep within our means. We are practically at least $1,000 ahead of liabilities. The first three years were years of trial, but our faith was great. We are now past the experimental stage we believe. The home is an absolute necessity. We do not intend that a faithful railroad man shall die in a poorhouse. Our pressing want just now is a large commodious fire-proof building. This obtained, then the boys will see to it that it is sustained and the helpless ones well cared for.

Most respectfully, L. S. COFFIN.
Ft. Dodge, Ia. President.

A RAILWAY BRIDGE AND BUILDING DEPARTMENT.

ONWARD BATES, M. AM. SOC. C. E., M. INST. C. E.

When I received an invitation to address you I felt that it placed before me a duty which I ought not to evade because you are on the threshold of your life work, and I stand toward you in the relation of a professional brother who has enjoyed extended opportunities for the acquirement of practical experience; and it appears to me that I can best fulfil my duty in this instance by drawing upon my long service in the profession, for such advice and encouragement as I can offer within the limits of this paper.

It is my aim to show you something of what the profession has in store for you; to explain some of its requirements; to present to you some of the difficulties you must encounter, and to set before you some of its rewards. I shall endeavor to avoid such of the theory and practice as is presented to you in your text books and in the lectures of your professors, and I will not occupy your time with descriptions of engineering works, which may be read in technical journals and society transactions. I shall rather try to set before you some of the conditions which you will meet in actual practice, and though my remarks are intended to be general, you will discover before I close that they are based upon the special line of practice in which I am at present engaged, and which is naturally the one upon which I am best informed.

The engineering profession is in its infancy, and as a profession it is only beginning to take the high rank it should have among the occupations of man, which enlist the best efforts of his mental and physical faculties. The wonderful advances in all branches of the profession within the last few years have brought it prominently before the people whom it serves, and compelled recognition from those to whom it has heretofore been almost unknown. Fortunately we are not entirely dependent on public esteem, and our occupation is of such a high and honorable character that in addition to its pecuniary rewards we have great satisfaction in our professional work and in the contemplation of what it enables us to accomplish.

The profession demands from us greater efforts and higher attainments than ever before, and the engineer of today needs more theory to meet the practical problems which confront him than was possessed by any of his predecessors. You should leave this great institution of learning well equiped with theory and with the rudiments of practice. The engineer's life is one of continued education, and you are expected to supplement your professional work with study, both of such theory as you may find yourselves in lack of, and of the examples of practical work to which you have access. It is for you to use the experience of others and to begin where they have left off. All the theory in the world will not make a successful engineer, nor can all practical problems be solved by any single individual. Life is too short for such a course, and to insure success you must add to what others have done before you.

Do not misunderstand me and assume that I advise you to commence at the top, for on the contrary, I believe that when you leave Purdue university with such honors as she can bestow, you are only prepared to begin your practical work at the very bottom. You will need to serve an apprenticeship to enable you to build properly when adding to what others have built before you assumed charge. Commencing at the bottom you will be sure of your foundation, and though you may not have to build every step as you advance, you will know the whole route, and your progress will be rapid in comparison with those who are not so well equipped at the outset. Professional distinction and practical rewards come as a rule (and as is proper) late in the engineer's career, but they are well worth working and waiting for, and there will doubtless be such rewards for those of you who can win them.

The engineering profession covers so great a field that most of us find it best to devote ourselves to special branches of it. The specialty in which each of you may soon find yourselves engaged may be the result of circumstances and not of choice, but when you are once established in any particular line of work, it should require an important consideration to induce you to take up some other line. Knowledge is always of value when it can be used, and the road to be traveled by an engineer is such a long one that the greatest progress is to be expected in those whose occupation is such as employs their previous experience.

I have chosen as a title for this address "A Railway Bridge and Building Department." because it covers that line of practical work with which I am most familiar, and I trust I shall make it interesting and instructive to all of you, and really helpful to any who may find their lines cast in such a department. I am of the opinion that engineers have not paid the attention to this class of work that it is entitled to from its great extent and variety. "A Railway Engineer" is usually considered to be one who is, or has been engaged on surveys and first construction of railways. The problem of surveys is solved before the railway is built, and the first construction is usually with temporary bridges and buildings. When the railway is put in operation, the engineering problem becomes one of maintenance; the track must be kept in safe condition for moving trains, and "permanent improvements" are made when warranted by the financial condition of the railway company.

A railway may be described as a machine for moving passengers and freight from one part of the country to another. It is (or ought to be) owned by the "company," and its financial problems are "engineered" by officials so far removed from the engineers of maintenance that they are generally unacquainted with each other. Its legitimate source of income is "passenger and freight earnings." Its traffic department induces people to travel and to ship commodities from place to place, at such rates as will provide "net earnings," and it brings this business to the points of shipment and delivers it to consignees at its designation. Its "transportation department" transports the passengers and freight on cars, usually hauled by locomotives. Its "maintenance department" keeps the machine in running order, and is usually subdivided into the department of "rolling stock and machinery," and "maintenance of way," which on some large railway systems is again divided into the "track department" and the "bridge and building department." All these departments and sub-departments, being engaged in the business of keeping the machine in order, and working it for the convenience of the public, and the profit of the company, or vice versa, have a common interest, and their duties and responsibilities are more or less common. In some cases it is difficult to define these duties within exact limits, and there is opportunity for friction between employes of different departments, but such friction does not need to exist when the heads of the departments place the interests of the company before their own selfish plans or fancied rights.

The amount of sub-division of departments will depend on any railway on its system of conducting its business, and this is controlled by officials high in authority, and influenced to some extent by the length of the railway and the amount of business. On a railway system of 5000 miles it may be proper to have sub-departments with respective heads, which would be combined under one head on a railway 500 miles long. The whole maintenance department of a railway, whether it is long or short, should be under the direction and control of a chief engineer, with such divisions of bridges, buildings, track, rolling stock and machinery among his subordinates as would be determined by the length and conditions of the road. This requires that the chief engineer shall be an executive officer, and that he shall have business judgment and the ability to handle men, and it will be advanced in argument that engineers lack these qualifications. To some extent this is the case, and if the maintenance of all the railway lines in this country was suddenly transferred to the care of engineers, it would be difficult to find a sufficient number of qualified engineers to assume the duties. The reason for this is plain enough, and it is that engineers have not been as a rule educated for executive work; and what is simply a lack of education can be remedied by supplying the deficiency. That engineers are as susceptible of business education as men in some other occupations may not be admitted by those who have been educated to think differently, but conditions heretofore have not been such as will warrant a general decision on this point. Railway engineers have been engaged principally in building railways, and the questions of maintenance are just now taking the position of greater importance, because of greater expenditures, and it is only beginning to be realized that there is an occasion for the permanent employment of engineers upon railways. It is held by some that while engineers may be competent to survey and construct railway lines, and to make plans and specifications for their maintenance, yet the actual maintenance of the work should not be entrusted to them. While they are willing to accord to the engineer the ability and the judgment to select a route for a railway, and to plan all of its works, they will not grant that he is capable of constructing and maintaining the works. This proposition, while it is generally accepted in some quarters, is on its face, unreasonable, because to properly plan and specify requires the same qualifications that are needed to execute. On the other hand it seems reasonable that the man who designs the machine and superintends its first construction, and fixes all the standards for maintenance, should be best qualified to assume charge of the maintenance. I suppose a majority of the railway men think that the maintenance of the property should be under the direction of the superintendent who is in charge of the transportation. There is much which can be said in favor of this, but when everything is taken into consideration, the strongest argument in favor of it that it is the present custom, and that it is not a conclusive argument in these times when it is in order to change existing customs in the effect to achieve progress. The superintendent of transportation operates the machine. He controls the movement of trains and has charge of transportation of passenger and freight. He is also the company's business representative in the territory served by the lines of which he has charge. His education is usually not of a technical character, and his knowledge of technical work is often obtained after his appointment as a superintendent. On the other hand the question of maintenance is solely a technical one, and the employes in charge of maintenance should be educated specially for their work.

The conditions of railway maintenance are undergoing a change, and the replacement of temporary structures by those of permanent character calls for technical knowledge which cannot be obtained except by special education. The maintenance of a railway is essentially an engineering proposition, and should be in the charge of an engineer, and the final head of the maintenance department should be the chief engineer of the railroad. By this I mean that the actual work of the construction and maintenance should be carried on by that department of which the chief engineer is the head. The fact that some of the best maintenance men in the employment of railways are not engineers does not alter the proposition that the maintenance men of tne future should be specially educated to meet the conditions of maintenance which will prevail in the future. The head of the maintenance department will of course have the policy which will control his department in classification of work and methods of business, dictated to him by his superior officers, and he should be prepared to furnish these superiors with all of the technical information which they may need to assist them in formulating that policy. While the department of rolling stock and machinery, or as it is frequently called, the motive power department, should be subordinate to the chief engineer, its actual head should be a mechanical engineer who has been specially educated for that branch of mechanical engineering.

*An address delivered before the Engineers' Club of Purdue University, Jan. 24, 1896.

The bridge and building department also requires special education, and while it may properly be united with the track department, making one department include the roadway and all structures, it has no close relation to the department of rolling stock and machinery. Its immediate practical head is, on most railways, a superintendent of bridges and buildings. This superintendent is usually a practical man and not an engineer, requiring that on a railway of importance there shall, in addition to the superintendent of bridges and buildings, be an engineer of bridges. I hold that the knowledge which is requisite for an engineer of bridges should also qualify him to be the superintendent of bridges and buildings, and that the candidate for a position in the bridge and building department should be trained to fill both positions. The joint position can be approached from either the standpoint of a practical mechanic or of a college graduate, and reached by supplementing the one with theoretical, or the other with practical knowledge. It seems more appropriate that the theoretical or school knowledge shall be acquired first, and it is easier to pick up the practical requirements than the theoretical ones, and consequently the line of advancement should commence with a technical school.

(To be Continued.)

TECHNICAL MEETINGS.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p.m., at the House of the Society, 127 East Twenty-third street, New York City.

The American Society of Irrigation Engineers. Third annual meeting will be held at Albuquerque, N. M., September 16-19. John L. Titcomb, secretary, 36 Jacobson block, Denver, Col.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Association of Engineers of Virginia, holds its informal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E. M., Albuquerque, N. M.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each mouth, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Tuesday in each month, at 8 p. m., at 12 West Thirty-first street, New York City.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. Hadley, secretary, Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Foundrymen's Association holds its meeting on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnston, 1522 Monadnock building.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

NOTICES OF PUBLICATIONS.

THE CHICAGO DRAINAGE CANAL.—Pamphlet 32 Pages Standard Size, 6 x 9 Inches. By The Ingersoll-Sargeant Drill Co., 26 Cortland St., New York. Illustrated.

The primary object of this interesting pamphlet is the presentation of information with regard to the use of compressed air in the work upon the Chicago drainage canal. The pamphlet contains a great deal of interesting information in regard to other features of the work and will be found to be valuable as a means of ready reference to data to which engineers will frequently desire to turn. The opening chapter describes the course of the canal, and the necessary works for controlling the Desplaines river, which required nineteen miles of levee, and an amount of excavation which brought the total cost of this river diversion to over $1,000,000. The necessity for the use of channeling machines for forming the side walls of the main channel through the solid rock sections was explained, and this chapter also includes a map of the sanitary district of Chicago. The second chapter gives a brief outline of the estimated cost of the work, and it is stated that the ambitious part taken by the Ingersoll-Sargeant machinery justified the publication of this volume. It illustrates the progress that is being made on the work, and incidentally includes some typical illustrations of this machinery in operation. The latest summary of these machines in use on the canal is given as follows: 34 Ingersoll-Sargeant channelers; 129 rock drills, and 7 air compressors, making in all 170 machines of the Ingersoll-Sargeant make. There is one of these compressor plants on each of sections 1, 8, and 15 and two each on sections 11 and 14. The number of steam shovels, locomotives and other machines is given in a table. A chapter is devoted to the ingenious contrivances which the contractors were driven to devise and employ on account of the low figures at which the work was taken, and which constituted entirely new departures in handling both rock and earth. Considerable space is given to the work done by compressed air which in some cases is transmitted through pipes two miles in length for distribution to the rock drills, and drainage pumps. The tall-tower platforms of the cableway plants are moved by compressed air, and it is stated that the experience of these contractors has led to the adoption of the Ingersoll-Sargeant machinery by Mr. J. B. McDonald, contractor for the Jerome Park reservoir in New York. Also 200 rock drills are in operation, together with nine air compressors supplied by this company, at the Anaconda mine in Montana.

This canal work is unquestionably the largest job of channeling yet undertaken, and it is natural to expect to see a number of illustrations of these machines in use. Several pages of records are included which are highly creditable to this company, and under the headings of interesting notes, the machinery and force employed, and contractors' prices, cost of operating channelers and wages paid on the canal, a great deal of information is given which by being presented in convenient form will be useful to engineers and contractors. The pamphlet is neat in appearance, and the illustrations are excellent half tone reproductions from photographs. It is from the press of Andrew H. Kellogg, Pearl street, New York.

PATENTS ON RAILWAY APPLIANCES.

[The following list of patents granted for inventions relative to railroad appliances for the week ending February 4, is reported especially for the Railway Review, by Chas. L. Sturtevant, patent attorney, Washington, D. C., from whom printed copies can be obtained for 15 cents each.]

Amies, Joseph H., Philadelphia, Pa., manufacturing composition railway ties, etc., 553,821.
Baringer, Joseph, Akron, O., track cleaner, 553,823.
Bradenburg, Wm. H., and F. H. Chilton, New York, car coupling, 553,835.
Dean, Francis M., Huron, S. D., track sander, 554,056.
Erb, Paris, Lancaster, Pa., car brake, 554,113.
Grigware, Edward N., assignor to himself, H. A. Weiberg, J. R. and F. R. Poss, Caseville, Mich., railway frog, 554,120.
Jewell, Frank, assignor of one-half to G. F. Burns, Batavia, N. Y., Railway switch, 554,026.
Matthews, Frederick, New York, switch for railways, 553,995.
McCord, Alvin C. and D. W., Chicago, Ill., dust guard for car axle boxes, 554,070.
McElroy, James F., assignor to Consolidated Car Heating Co., Albany, N. Y., automatic switch, 554,080.
Meyers, Frank H., Philadelphia, Pa., car door fastening, 554,133.
Mulligan, John J., Vicksburg, Miss., car door, 554,078.
Park, Harvey S., Chicago, Ill., fluid pressure brake, 554,086.
Price, Charles B., Pittsburgh, Pa., Frogless switch, 553,934.
Rich, Abraham L., Pittsburgh, Pa., system for supplying water to locomotives, 553,967.
Robinson, Wm., Boston, Mass., car brake, 553,871.
Robinson, Wm. M., Dilliner, assignor of one-third to J. E. Minor, Mapletown, Pa., car coupling, 554,201.
Scott, James E., Louisville, Ky., car coupling, 554,146.
Sessions, Henry H., assignor to Pullman's Palace Car Co., Chicago, Ill., car platform buffer, 554,007.
Smith, Orison M., assignor of one-half to H. Bridgeman and N. F. Russell, Duluth, Minn., automatic gripping device for inclined railways, 553,942.
Taylor, John D., Chillicothe, O., apparatus for railway signaling and switching, 554,097.
Whitestone, James, London, Eng., securing rails to metallic sleepers, 554,014.
Whitlow, Charles, Washington, D. C., car window ventilator, 554,160.
Whitney, Walter S., Glens Falls, N. Y., car brake, 553,973.
Wolhaupter, Benjamin, and W. S. Jones, Chicago, Ill., power brake for railway cars, 553,883.

PERSONAL.

Mr. L. M. Schwan has been elected a director of the Lake Erie & Western Railroad in place of Nelson Robinson, resigned.

Mr. W. W. Daniel, general freight agent of the Columbus, Sandusky & Hocking, has resigned. His successor is not known at present.

Mr. Wm. D. McAllister has been appointed general agent of the San Antonio & Aransas Pass Co., with headquarters at Denver, Col.

Mr. L. S. Rose, division roadmaster of the northern division of the Central Vermont Railroad has resigned that position to enter other business.

A. D. Ward has been appointed purchasing agent of Chicago Great Western, with headquarters at St. Paul, e Mr. John Warwick resigned.

Mr. E. P. Hannaford, who for thirty years has been chief engineer of the Grand Trunk, retired February 1. He was succeeded by Mr. Joseph Hobson of Hamilton.

Mr. Charles Kennedy, formerly representative of the Rock Island at Portland, has been appointed general Eastern passenger agent of the Rock Island at New York.

Mr. C. M. Lawler, general manager of the Philadelphia, Reading & New England road, has resigned, and Generai Passenger and Freight Agent N. J. Martin has been appointed to succeed him.

Mr. M. V. Meredith of Saginaw was on February 1 installed as general manager of the South Haven & Eastern Railway. It is said that this road has been practically boycotted for months past by reason of its poor passenger service, and the first act of the incoming official will be to present to the bondholders an estimate of the sum necessary to put the line into first-class condition.

Mr. E. S. Andrews is appointed traveling passenger agent of the Chicago & Northwestern Railway, with headquarters at No. 1648 Lawrence street, Denver, Col., vice Mr. C. G. Burkhardt, resigned.

It is officially announced that Mr. R. L. Porter has been appointed auditor of ticket accounts of the Chicago, Burlington & Quincy road, succeeding Mr. L. N. Hopkins, who has been transferred to other duties.

Mr. Thomas McKune, who has been an employe of the Lehigh Valley Railroad for 15 years, has been selected as roadmaster of the Wyoming Valley division to succeed Mr. Morrison, who recently resigned.

Mr. J. S. Stephenson, general superintendent of the Grand Trunk Railroad, has severed his connection with that road. His successor has not yet been appointed, but report says it is to be a Cleveland man.

Mr. G. L. Lansing, secretary and comptroller of the Southern Pacific Co. died at San Fracisco, Cal., on Feb. 4, after an illness of several months. He had been connected with the railroad company for many years.

Mr. Adolphe D. Caron, only son of the postmaster general of Canada, has left for England to assume the duties of private secretary to Mr. L. J. Seargeant, resident Canadian director in London of the Grand Trunk Railway.

On Feb. 1 Mr. L. J. Seargeant sailed on the Campania to assume his duties in London as advisory member of the board of directors of the Grand Trunk Railway of Canada. He was formerly general manager of the Grand Trunk.

Mr. E. Schryver, who for several months has been division freight agent for Alabama Great Southern has resigned that position to become assistant general freight agent of the Cincinnati Southern with headquarters at Chattanooga.

Mr. D. W. Aldridge has been appointed traveling passenger agent of the Chicago & Northwestern Railway Company with headquarters at No. 127 the Arcade, Cleveland, O., vice Mr. F. M. Snavely, promoted. This appointment was effective February 1.

Mr. G. M. Bosworth, freight traffic manager of the Canadian Pacific Railway, has issued a circular announcing that Mr. E. Tiffin is appointed general freight agent of Ontario division lines, with office at Toronto, Ont., in place of Mr. J. N. Sutherland, transferred.

On the last day of December the "Maple Leaf's" (Chicago Great Western) new city ticket office at No. 7 W. Ninth street, Kansas City, Mo., was opened with Mr. George W. Lincoln, their Kansas City traveling passenger agent, in charge, and Mr. C. J. Weaver, assistant ticket agent.

Mr. V. E. McBee has been appointed general superintendent of the railroads comprising the Seaboard Air Line, with headquarters at Portsmouth, Va. Mr. Edmund Berkeley has been appointed superintendent of the third division of the Seaboard Air Line, with headquarters at Atlanta, Ga.

Mr. John Harlan of Bowling Green, Ky., stock claim agent of the Louisville & Nashville Railroad, has been made chief of detectives of that road. He succeeds Mr. C. N. Warner, who goes to St. Louis to accept a position in the railway business there. Mr. Harlan took charge of his office February 1.

Mr. Clinton W. Sells has been appointed manager of the Pike's Peak Cog road. President H. S. Cable, who has been acting as manager of the road since it opened, was recently elected president of one of the branch roads of the Rock Island system and was compelled to leave the active management to Mr. Sells.

Mr. Newton E. Alexander, for the past six years general yardmaster of the Pittsburgh & Western from Girard to Hasleton, has resigned, having been offered a more lucrative position with Calvin S. Brice on the Lake Erie & Western. Mr. James E. Aiken, has been appointed to fill the vacancy and has entered upon his duties.

Assistant General Manager Allen of the Missouri, Kansas & Texas, announces that, effective at once, the locomotive and car departments will be consolidated under the supervision of Mr. William O'Herin, with title of superintendent of machinery and equipment. The office of superintendent car department is abolished.

Mr. C. A. Pratt, who for more than twenty-five years has been managing the eating houses on the Missouri Pacific-Iron Mountain lines will take charge of the catering department of the St. Louis Union Station, the proposition submitted by him having been accepted by the Terminal Board. The new arrangement will become effective March 1.

Mr. F. H. Lord, general passenger and ticket agent of the Chicago Great Western, announces that Mr. J. N. Storr is appointed traveling passenger agent for this company, with headquarters at No. 343 Broadway, New York. Mr. Storr's territory will cover the state of New York; also the Grand Trunk Railway from Prescott to Hamilton, Ontario.

Mr. F. F. Whittekin, chief engineer of the Kishakoquillas Valley R., has also been appointed chief engineer and manager of the Ferro Carril de Antiogina, of the state railroads of Columbia. Mr. Whittekin retains his position on the Kishakoquillas Valley Railroad, but his interests in several roads will be looked after by an assistant whom he will leave in charge.

Mr. R. G. Matthews, formerly general superintendent of the Buffalo, Rochester & Pittsburgh R., has retired from that position. The duties of the office will be discharged for the present by George E. Merchant, assistant to the president of the company. It is given as a reason for Mr. Matthews' resignation that the directors of the road wish to cut down the expenses of the general superintendent's office, and that hereafter the duties of that office will be assumed by the president's assistant.

The permanent board of directors of the reorganized Erie Railroad, elected at a meeting held at New York on February 4, consists of C. H. Coster, J. J. Goodwin, A. S. Hewitt, John G. McCullough, D. O. Mills, Alexander F. Orr, Geo. H. Quintard, Samuel Spencer, Francis L. Stason. Eben B. Thomas, J. Lober Welsh and Samuel E. Williamson. There is one vacancy in the board.

A special notice has been issued by Mr. George F. McKay, division freight agent of the Lake Shore, appointing Mr. F. L. Talcott contracting agent of the company, with office at No. 221 Main street, Buffalo. Mr. Talcott will have charge of such duties as are assigned to him by Mr. J. F. Lane, agent at Buffalo, or the general office at Cleveland. This promotion comes to Mr. Lane? after a period of fifteen years' service to the Lake Shore. For a long time he was a clerk in the Louisiana-street freight office, and for the past four years has acted as rate clerk and soliciting agent.

Mr. H. D. Badgley has been appointed assistant general passenger agent of the Chicago Great Western Railway with headquarters at Chicago. He is spoken of as a gentleman of unusual executive ability, and general passenger agent, Lord, expects to transfer a large portion of the work to his shoulders. To accept this position Mr. Badgley gives up the position of New England passenger agent of the Chicago, Burlington & Quincy, which he has held for the last nine years. Prior to 1887 he was one of Burlington's traveling passenger agents. The appointment will be effective March 1.

The following appointments and changes have been made on the Alabama Great Southern. Mr. A. G. Craig is appointed division freight agent, with office at Birmingham, Ala., vice Mr. E. Schryver, resigned. Mr. R. H. Jones is appointed soliciting agent with office at Montgomery, Ala., vice Mr. J. M. Wyly, resigned. Mr. W. C. Stephens is appointed soliciting agent, with office at Knoxville, Tenn., vice Mr. J. G. Cantrell, resigned. Effective February 15, 1896, the positions of northwestern agent at Kansas City, Mo., and of soliciting agent at New Orleans, La., August, Ga., Ocala, Fla., and Washington, D. C., are abolished.

The following changes in the operating department of the Atchison, Topeka & Santa Fe Railway have been announced: H. N. Mudge, who heretofore was general superintendent of the Eastern division, will also take care of the Western, Rio Grande and New Mexico divisions, with headquarters at Topeka, Kas.; Charles Dyer, heretofore general superintendent of the Western division, has been made superintendent under Mr. Mudge; T. H. Sears has been made train dispatcher, with headquarters at La Junta in place of H. J. Stanley. The Philadelphia agency has been abolished, aud Freight Agent J. B. Derby transferred to New York. The following agencies have been also abolished: Omaha, Quincy, Buffalo, Cleveland and Minneapolis.

New York papers say that in an interview with Mr. W. J. Spicer, general manager of the Chicago & Grand Trunk road, he made the statement that he was officially informed only last Saturday that the board had decided to merge the position of general manager of all the Grand Trunk lines into the one office of general manager of the Grand Trunk Railway, in Montreal. Arrangements are now in progress for Mr. Spicer's retirement from the position and duties which he had been charged with for the last 12 years, after a previous very long service as general superintendent of the Grand Trunk Railway at Canada. In all, he has had somewhat more than 40 years of continuous connection as a general officer, with practically the same property.

Mr. Edward H. Johnson, consulting engineer of the Chicago & Northwestern Railway, died suddenly of heart disease on Tuesday afternoon of this week, on one of the company's trains near Ravenswood, where he lived. He appeared in his usual good health when he boarded the train at Ravenswood, but he had scarcely taken a seat in the car when he complained of a peculiar sensation about the heart. Five minutes later he was dead. Mr. Johnson was 70 years old. He came to Chcago in 1872 from Cooperstown, N. Y. He was made chief engineer of the Northwestern road and held the position until 1887, when he resigned, owing to his advanced years. The company, however, made him consulting engineer. The body was removed to Jordan's undertaking establishment, from which it was sent to Rochester, N. Y., for the funeral and burial.

Mr. C. H. McKnight, at present acting commissioner of the Central Traffic Association, has been appointed chief clerk of the joint Traffic Association, with headquarters in New York, and will be the chief assistant to Commissioner Blanchard. Mr. McKnight came to Chicago with Commissioner Blanchard in February, 1886, as his chief assistant and secretary. A year ago he was appointed commissioner of freight traffic of the Central Traffic Association, and upon Chairman Blanchard's retirement a short time ago he was elected acting commissioner of the Central Traffic Association. He would undoubtedly have been elected commissioner of the new Central Freight Committee, which is to come into existence next April, had he refused the position offered him by the Joint Traffic Association, as his long experience with the affairs of the Central Traffic specially qualified him for the position. Mr. H. C. Smith, secretary of the Central Traffic Association, was on February 6 appointed acting commissioner in Mr. McKnight's place.

Assistant General Freight Agent C. A. Barnard, of the Cleveland, Akron & Columbus, has tendered his resignation, effective February 15, to accept a similar traffic position with the Ohio Southern. In accepting this new position Mr. Barnard will reassume official relationship with Mr. Brockenbrough, formerly traffic manager of the Cleveland, Akron & Columbus. He will look after the coal traffic of the property, and until May 1 will be located in the coal district, with office at Jackson, Ohio. After that date his office will be at Springfield. The jurisdiction of Mr. Barnard, like that of Mr. Brockenbrough, will extend over the Lime Northern, now pushsng its way rapidly from Lima towards Toledo. Mr. Barnard resigned a position as freight agent of the Big Four at Cincinnati in July, 1894, to accept his present position with the Cleveland, Akron & Coumbus. His previous railroad experience had been in the service of the old Ohio & Mississippi and the Big Four at Cincinnati, and he won his laurels as freight man in that city in the midst of lively competition.

Mr. Oscar G. Murray, who has resigned his position as second vice president of the Big Four road, in charge of traffic, to become operating president of the Baltimore & Ohio, will have no successor on the Big Four. The office he had will be abolished, and its duties divided between General Freight Agent Cost and Passenger Traffic Manager McCormick, both of whom will report direct to President Ingalls. As to the representation on the Board of Joint Traffic Managers, it is not yet known who will succeed Mr. Murray. The new general manager of the Baltimore & Ohio has risen from the ranks in the service, beginning railway work in 1872 as a ticket agent on the Galveston, Houston & Henderson line at Galveston, Tex. In the service of that road he rose finally to be general passenger agent. He has also occupied various positions of importance with the Gulf, Colorado & Santa Fe, the Missouri Pacific, the Texas & Pacific and lastly with the Big Four. The salary of the new office of Mr. Murray is said to be $30,000.

Mr. William M. Sage, since 1888 freight traffic manager of the Chicago, Rock Island & Pacific road, died on February 6, at his home on Fortieth street in this city. He went to his office as usual on Wednesday morning, but in the afternoon was stricken with peralysis and lingered until Thursday evening at 7 o'clock, when he died. Mr. Sage was a Scotchman by birth, and at the age of 12 he left his home for Canada, and on reaching that country made his way to Toronto, where he succeeded in obtaining employment in a clerical capacity. He subsequently became manager of a bank in the chief city of Ontario and held that position for a number of years. Then he decided on coming to the states. He moved to Milwaukee and became bookkeeper in a mercantile establishment. During the war he attached himself to the quartermaster's department in Chicago and served there during the years 1865 and 1866. He was one of the oldest and most widely known railroad men in Chicago. His career as a railroad man was spent with the Rock Island and extends over a period of twenty-nine years. It might be said he had grown up with the Rock Island system, as on May 1, 1867, he secured a clerical position in the freight department of that road and was shortly after promoted to be assistant general freight agent. On January 1, 1878, he was promoted to be general freight agent, and on March 1, 1888, became freight traffic manager. He was universally admitted to be one of the ablest traffic men in the country.

RAILWAY NEWS.

Cincinnati, New Orleans & Texas Pacific.—It is now thought probable that the Southern railway will have full control of the Cincinnati, New Orleans & Texas Pacific in a very short time, and certain movements of prominent railway officials in the past week were cited as an indication of an approaching change. Last week in Washington it was stated that Mr. Spencer was very desirous of getting absolute control of the Cincinnati Southern, and that negotiations to that end were pending. It will be remembered that when the Taylor-Shoemaker syndicate secured control of a half interest in the Cincinnati Southern it was predicted that the deal was one for speculation only, and that sooner or later Spencer would get the line.

Columbus, Hocking Valley & Toledo.—An official circular announces that this company will extend its train service, both passenger and freight, over the Wellston & Jackson Belt Railway to Jackson, Ohio, taking effect February 10, 1896. This branch has been constructed from McArthur Junction, O., through the Wellston and to the Jackson coal fields, a total length of 18 miles, the road when completed to be operated both by electric and steam power.

Florence Northern.—The Chattanooga Times says: "There is now more than a probability of the sale of the Florence Northern R. The road was projected to run from Florence, Ala., to Linden, Tenn., where it would connect with the Tennessee Midland. At Florence it would connect with the Memphis & Charleston and the Columbia branch of the Louisville & Nashville. It seems to be definitely arranged that the Southern is to get the Memphis & Charleston, and if this is the case the Florence Northern would make a good feeder, against the interests of the Louisville & Nashville, which reaches the territory from the north. The Florence Northern has been graded along the valley of Cypress creek into Butler's valley, a distance of about 25 miles. There the work ceased after several substantial structures had been built. The ties and rails are not laid, but the road-bed could be put into condition to receive them at a small cost. Neely, Smith & Co., of Chattanooga, were the contractors who built the road and subsequently bought it to satisfy their claims. At Embrey's, on the line of the road, about 8 miles from Florence, is a cotton mill doing most excellent business, and in the valley and hills are ore beds and deposits of stone of various grades for building or fluxing purposes. A few miles ahead of the road is the great Allen's creek ore fields, and the possibilities of the discovery of apatite or phosphate of lime are apparent in many sections. If the so-called period of depression had not come when it did this road would certainly have been in operation long ago."

Florida & East Coast.—The extension which is being built to the Florida & East Coast road has been finished to Cypress Creek, 35 miles south. Captain William Varnedoe, contractor for the grading of the eight miles south of New river, has finished his work, and returned to Palm Beach. He reports the work progressing rapidly. Contractor Jenkins, who is finishing the grading into Miami, will finish in a week or two. Captain E. L. Anderson is laying the track very rapidly. All of the sub-contractors have finished, and the work now being done is by the general railroad contractors.

Fort Worth & Denver City.—The reorganization committee of the Fort Worth & Denver City road, the plan for which has already been voted in these columns, reports that over three-quarters of the bonds have been deposited and informs bondholders who have not yet subscribed to the plan that bonds must be deposited before Feb. 1, or they will be subject to the penalties the committee will then impose. Under the mortgage, bonds not deposited will not be entitled to any interest for five years, and will also be deprived of the bonus paid on each bond of $275 in preferential dividend stock. The company, it is said, has decided to extend its line to Aransas Pass. The proposed extension will be from Fort Worth to Palestine, thence to Kirbyville, the northern terminus of the Gulf, Beaumont & Kansas City. The extension will pass through a country virtually without railroad facilities.

Georgia Midland.—On Feb. 1 the Georgia Midland road was sold at Columbus, Ga., to the bondholders, there being but one bid. The sale took place at 12 o'clock at the depot, as had been advertised, and was conducted by Master Commissioner J. W. Murphy. Mr. R. A. Lancaster representing the bondholders, made the bid, and as there were no buyers, the property was knocked down to him at $500,000. It was stated that so far no definite plan of reorganization had been settled upon, and it is not probable that any active steps will be taken until the sale is ratified by the United States court, which will be during the present week. Afterwards a complete reorganization will be begun and the road extended, probably, to Atlanta. Under the charter they have the right to extend it to Atlanta, or to Athens, but the former course is said to be in view. A survey of the extension from McDonough to Atlanta has already been made.

Gulf & Interstate.—Tracklaying on the Gulf & Interstate was resumed on Jan. 18 on the 12 mile section between the ends of track now built out of Boliver Point and Beaumont. This section will complete 70 miles of road. Early last year a bonus was voted by the town of Beaumont if the road between Galveston and that town was completed before Jan. 1. The time has been several times extended, finally to Jan. 30, but as this time is again passed, the road may not earn the subscription.

Kansas City, Pittsburgh & Gulf.—Mr. Bernard Corrigan, of Kansas City, one of the wealthiest contractors in this country, has secured the first fifty miles of construction of the Kansas City, Pittsburgh & Gulf road. He has three train loads of outfit which left Kansas City last week for Shreveport. The 25 miles south of Corrigan's 50-mile contract have been let to M. Tausey and R. M. Quigley & Co., of St. Louis, who had a contract on the road north of Shreveport. Their southward contract is in Sabine parish. George Signor, of Sodus, tie contractor, has secured the contract to furnish ties for 200 miles of the road. Mr. G. Knoble, resident engineer from Texarkana is quoted as saying that in about 60 days the road will be operated from Texarkana.

Little Rock & Memphis.—The sale of the Little Rock & Memphis road which has been advertised to be sold on January 22, was at that time again postponed for four weeks, this being the third postponment. The opinion in Arkansas is that the reason why the sale was postponed is that the bondholders requested it, and that within another month they would be prepared to bid it in for themselves. In that event the road will be extended on the south side of the Arkansas river and eventually become a competing line to the Goulds' interest in Arkansas.

Mobile & Girard.—The directors of the Mobile & Girard have filed a claim for $22,722 against the receivers of the Central of Georgia, which they claim as rental on the road from June 1, 1892, to August 12, 1893, when the receivers under the order of court offered to transfer the property to the president and board of directors provided they did not wish the receivers to continue to operate it and pay as rental only what was made as net earnings. There is also a claim for $45,500 as interest on the outstanding bonds of the company for that time, these claims being made under the agreement which existed between the Mobile & Girard and the Central of Georgia when it was operated by the latter. In March, 1893, however, the Mobile & Girard was placed in the hands of Receivers Comer and Hayes under a separate bill in the Alabama courts. The receivers have no funds for the payment of the claims. A movement has been started in Brewton, Ala., to have the road extended from its present terminus, Seabright, south to Brewton, and the promoters of the plan believe that they will be successful. The original charter of the railroad provided that it should intersect the Alabama & Florida, now the Mobile & Montgomery road, at or near the place at which the town of Brewton has been built up.

Montgomery, Tuscaloosa & Memphis.—The Montgomery, Tuscaloosa & Memphis Railroad was sold on Feb. 3 by the register in chancery, and was bid in at $300,000 by Colonel H. C. Tompkins for the bondholders. There are outstanding $869,000 in bonds. From Montgomery to Tuscaloosa is 105 miles, and the greater portion of the way the road is graded but no track has been laid. At Columbus, Miss., 55 miles further, it would make connection with the Ohio & Mississippi. Bonds have been issued to the amount of $860,000.

St. Joseph & Grand Island.—An order was received on Jan. 30 at St. Joseph, Mo., by Federal Commissioner Pollock, from Judge Sanborn of the eighth federal district to the effect that the order of foreclosure and sale of the St. Joseph & Grand Island Railway was amended so that the upset price of the road may be $3,000,000 instead of $4,000,000, as was at first decreed. The date for the sale of the road has not yet been fixed. The bidder must deposit $100,000 cash as a guarantee.

NEW ROADS AND PROJECTS.

Arkansas.—A preliminary survey is being made for the Sunnyside, Hamburg & Western road, from Sunnyside to Hamburg, a distance of 50 miles. The road which will be owned by Mr. Austin Corbin, the New York capitalist, will be built principally by Italian colonists recently recently located at Sunnyside. It is said that a subsidy of 30,000 acres of land has been pledged by citizens of Chicot and Ashley counties to secure the road, which is to be in operation within twelve months. The road will open up a valuable agricultural and timber country.

Canada.—A company has been incorporated under the name of Restigouche & Victoria Colonization Co. to build a railroad from Campbellton on the bay of Chaleurs southward to Van Buren and St. John River, about 106 miles. The president of the road is F. R. Bosselly, Toronto; secretary, H. C. Secord, Toronto; treasurer, George de Mets, New York. The manager is E. A. Charters, of Sussex,

N. B. The proposed line lies through a fertile country heavily timbered with spruce, cedar and other hard woods.

Colorado.—Articles of incorporation have been filed in Colorado for the California Eastern. The object of this company and the California & Salt Lake which has been incorporated in Californiai s said to be to extend the Nevada Southern road from Manvel, Cal., to Milford, Utah, about 250 miles. A number of years ago the Union Pacific graded a line from Milford, Utah, southwest to Pioche, Nevada 110 miles, but the few miles of track which were laid were, subsequently torn up. It is said to be the intention of the new company to use this old grade and build to a connecsion with the Union Pacific system at Milford. The incorporators are R. W. Woodbury, Earl M. Cranston, W. N. Byers and Earl B. Coe.

The final surveys for the Florence Southern road have been completed and two-thirds of the right of way has been secured. It is now announced that construction will begin March 1 on this road from Florence to Silver Cliff, Col., s5.3. The president of the new road is Mr. W. E. Johnson and Mr. R. L. Kelly is chief engineer, both of Florence, Col.

Florida.—Work on the Tallahassee Southeastern, which is projected to run from Tallahassee to Old Town, on the Suawanee river, is to begin this month, according to reports from that part of the country. The road, which is to be 101 miles in length, was begun under the name of Florida, Georgia & Western, and in 1892 6½ miles of track were laid from Tallahassee southeast and 35 miles graded from Lake Como to Ancilla. The line is surveyed from Ancilla to Old Town. The president of the company is Mr. Edward Lewis of Tallahassee, and it is said that the company will do the construction work with its own forces.

According to recent advices from Florida the steam yacht May has for the past three months been under charter with a party of civil engineers from Philadelphia, whose mission was to see if a railroad could be built from the mainland of Florida to Key West, using the keys along the coast from Key Largo to the key upon which Key West is built. No report has as yet been rendered.

Illinois.—On Jan. 31 articles of incorporation were filed with the secretary of state at Springfield for the Chicago & Southern Illinois R. Co. It is proposed to build and operate a road from St. Elmo, on the Vandalia Line, in a northerly direction through the counties of Fayette, Shelby and Moultrie to a point near Hampton, on the Peoria, Decatur & Evansville. The survey has just been started, and it is expected to begin active construction work in 30 days. The chief engineer is N. R. Olcott, who has been chief engineer of the Chicago, Paducah & Memphis and other roads built in Illinois in the last few years. The incorporators are A. W. Hubbard and M. S. Cartter of St. Louis; N. R. Olcott, M. H. Luff and John W. Griswold, of East St. Louis. The capital stock is $500,000.

The directors of the proposed Peoria, Lacon & Northern have decided to make another survey from Peoria, Ill., to La Salle. The company was organized a few weeks ago for the purpose of building a railroad from Peoria to Spring Valley, about 50 miles, but the preliminary surveys have been hindered by floods.

Indiana.—An electric line, 103 miles in length, and which is said to be the longest electric road in the country, is projected through Northern Indiana, originating at Celina, O. It is planned to build northwestwardly through Geneva, Montpelier, Warren, Lincolnville, Wabash, Roann, to Rochester. It is the intention of the builders, a wealthy syndicate, to handle both freight and passengers at extremely low rates, and the line will be laid with 70-lb. steel rails and finely equipped. Mr. Charles Everett of Fort Wayne represents the syndicate, and at a recent meeting with the Wabash businees men, said that a subsidy of $70,000 would be asked from that county. The capitalists will put a million and half in the property, and it is hoped to have the road in operation in one year.

Iowa.—The Rock Island, Muscatine & Southwestern R. Co., which was recently incorporated, is now making a survey for the projected line, under the direction of Mr. John C. Kille of Rock Island. The road will be about 25 miles long and is to be built for the purpose of developing valuable fields of coal and potter's clay along the line.

Michigan.—It is stated at Champion, Mich., that a surveying party is running lines for an extension of the St. Paul road from Champion to Ishpeming, which will be built early in the spring. Immediately after completing the survey, this road's engineers will begin surveying a line from Champion to Calumet. Whether a line will be finally built to Calumet from Ontonagon, or from Champion, will depend largely on the result of the coming survey, but the line to the copper districts will, without doubt, be built in the spring.

The Lake Superior & Ishpeming R., which is to connect Ishpeming with Marquette—a distance of 19 miles—has now a force of about 700 men at work on construction. The surveys were completed some time ago, and the contractors, Winston Brothers, of Minneapolis, began work in November. The bridge over Dead River will be 300 ft. long.

Ohio.—On January 29 the stockholders of the Cleveland & Southwestern R. Co. met in Bucyrus and elected directors as follows: Thomas Beer, Wm. C. Beer, of New York City, Shannon Clements, Smith W. Bennett, and W. A. Blicke. After the transaction of other business of a private nature the meeting adjourned. The directors then held a meeting and elected officers with the following result: President, Thomas Beer; vice president, W. C. Beer, of New York; secretary, Robert Beer; treasurer, W. A. Blicke. The gentlemen interested in the project feel very confident of the building of the road and that it will pass through Bucyrus. They are satisfied that the proposed route is one that can well sustain a paying property, and that this can be so readily demonstrated as to render the securing of the capital to build and equip the road an easy matter. To Bucyrus the new road would mean easy access to all parts of the county, a direct route to Cleveland, and an outlet to the southwest. It is generally understood that an old established road is behind this scheme.

The Central Ohio & Pennsylvania R. Co. was incorporated in Ohio on January 14, to build a railroad from Warren, Ohio, to the Pennsylvania state line. The incorporators are Robert J. Hamilton, Frank S. Darley, John A. Moof, Joseph B. Turner and Thomas C Willard. The headquarters of the company will be at Cleveland, and the capital stock is $50,000.

The Cincinnati, Hillsboro & Western road, which is projected to run from Cincinnati to Wellston, will be about 109 miles in length. The road is completed from Wellston to Jackson, and the line was graded many years ago from Milford to Fayetteville, 22 miles. It is also graded in sections from Hillsboro to Jackson, 70 miles. The road will form an air line from the great coal and iron fields of southern Ohio to Cincinnati, passing through rich forests and fine quarries of red and white sandstone east of Hillsboro. Officers have not yet been elected, but it is expected that a permanent organization will soon be effected and the company will be ready to negotiate with capitalists or construction companies.

Oklahoma.—Last week ground was broken at Tecumseh for the construction of the St. Louis, Oklahoma & Texas Air Line Railway, to be constructed at once from Tecumseh to Sapulpa, I. T., to connect with the Frisco. Later it is the intention of the company to continue the line from Tecumseh to Purcell and on southwest into Texas.

South Carolina.—It is said that work will soon begin on the Spartanburg & Henrietta road, as the surveys have already been made. It seems that in 1882 the city of Spartainburg voted $25,000 toward the project, and two years later Spartanburg township, of Spartanburg county, S. C., also voted $25,000 additional. This gives the new road $50,000 to start with.

It is said that there are several important bills in the nature of new railway construction, now before the South Carolina legislature. Among the roads in that state which it is proposed to build is one through the cotton mill district. The many mills in the locality of Clifton Mills, Pacolet, Spartanburg and other places adjacent complain of the inadequate shipping facilities. The freight business of the mills in that locality alone amounts to over $500,000 annually, and it is proposed to build a new road to permeate that section and connect with the Seaboard Air Line and Ohio River & Charleston systems.

It is now stated that all arrangements are completed for the extension of the Carolina Midland road to Greenwood, a distance of 60 miles, and the new company will be known as the Greenwood, Anderson & Western.

South Dakota.—Reports from Rapid City, South Dakota, state that bonds have been sold to complete the first 32 miles of the Dakota, Wyoming & Missouri River road, from Rapid City west. Most of the grading is finished and several miles of track have been laid. The road is projected to the Scull creek coal fields in Wyoming, 87 miles from Rapid City.

Texas.—Mr. A. A. Chapman, in charge of the construction of the Denison & Northern R. from Denison to the Choctaw coal fields, has reported that all arrangements for the building of the line are completed, and says it will penetrate one of the finest sections of that country and open up to settlement and development one of the best parts of the territory. Other reports from that territory state that the receiver of the road is fast paying off claims against that company and that preparations are on foot for resuming the work of construction.

INDUSTRIAL NOTES.

Bridges.

—It is stated that the Philadelphia, Wilmington & Baltimore has concluded to rebuild the Media (Pa.) bridge, making it of sufficient width to accommodate double tracks. This bridge is 104 feet in hight.

—The contract for the three bridges to be built near Hallettsville, Texas, has been awarded to the Penn Bridge Co. of Beaver Falls.

—The city council of Cumberland, Md., has appointed a committee to investigate the advisability of erecting a bridge over the West Virginia Central Railroad tracks in that city. Address the mayor.

—It is reported that two spans of a new bridge over the Maumee river, about eight miles from Toledo, have been injured by ice, causing a damage of at least $50,000.

—It is stated that the Grand Rapids, Mich., council has directed the board of public works to make an estimate of the cost for an iron bridge over 400 feet long across the Grand river at Butterworth avenue.

—At the spring election in Peoria, Ill., it is stated that the question of reconstructing a bridge over the Illinois river, at a cost of $100,000, will be voted upon.

—It is stated that the managers of the Iowa & Nebraska Pontoon Bridge Co. at Sioux City, Iowa, have been notified by the secretary of war that, as the new Pacific Short Line Bridge has been thrown open to the public, the pontoon bridge must be removed within twelve months. The pontoon managers think that by cutting rates they can compete successfully with the Short Line, and are talking of organizing a company to put in a low wagon bridge, for which a charter was granted by congress a year ago. The estimated cost of such a structure is $500,000.

—It is announced that the plans for the bridge across the Ohio River at East Liverpool, Ohio, have been changed. Instead of abutments at each end, the spans will extend the entire length, increasing the bridge proper 150 ft. and adding $50,000 to the cost. The bridge as planned now will be all steel. The company took possession of the property bought for approaches Feb. 1, when the construction gangs began work. John Shrader of Pittsburgh, Pa., was recently awarded the contract at $225,000 for constructing the structure.

—Bids will probably be asked in February for the superstructure at Minneapolis, Minn., of a bridge 435½ ft. long, consisting of five plate girder spans and one 123 ft. truss; 42 ft. roadway and two 6 ft. walks; iron floor and cedar block pavement. The substructure has just been completed.

—Articles of incorporation have been filed for the Los Angelas Bridge Co., the capital stock being $10,000. The directors are: D. W. C. Sawyer, B. J. Arthur, R. A. Sawyer, K. L. Arthur and J. B. Spence, all of Monrovia, Cal.

—The Youngstown Bridge Co. has established a New York office in charge of Henry A. LaChicotte, M. Am. Soc. C. E., and for the present will occupy offices at 136 Liberty street. The company also has a Baltimore, Md., office at 406 Water street, in charge of H. Ashton Ramsey, M. Am. Soc. M. E. Its southern office at 421 Jackson Building, Nashville, Tenn., is in charge of H. T. Sinnott, and its Fort Worth, Tex., office is in charge of L. S. Leversedge. Its western office at Keokuk, Ia., formerly in charge of James B. Diver, was discontinued some months ago.

—The Lafayette (Ind.) Bridge Co. has been awarded the contract for the erection of a bridge at Green Bay, Wis. It is to be a 160 ft. steel draw span crossing the East river.

—The Gillette-Herzog Mfg. Co. of Minneapolis, Minn., reports that it is busy in both bridge and building departments, and among other contracts has closed the following: Cold storage building, 428x175 ft., for the Tamarack Mining Co. at Dollar Bay, Mich.; three girder spans for the Duluth & Winnipeg Railway at Duluth, Minn.; three combination spans, each 112 ft. for the Minneapolis & St. Louis Railway at New Ulm, Minn.; 145 ft. girder drawbridge at Carrolton avenue, New Orleans, La.; two 100 ft. combination highway spans for township of Masonville, Wis.; 150 ore chutes for the Dulut h& Winnipeg Ry., Duluth, Minn.; sixteen coal pockets for the American Sugar Refinery Co., at New Orleans, La.; iron work for new postoffice building at Fort Worth, Tex.; steel water tower at Sigournoy, Ia.; 244 ft. steel draw span over the Mississippi river at Aitkins, Minn.; a steel dredge for Captain Barker of West Superior, Wis., and the iron work for the new court house at Le Sulur, Minn. Vice president and chief engineer, Frank J. Llewellyn.

—The county court of Winchester county, Va., has decided to erect an iron bridge across the Elk river, to be 80 ft. and 10 ft. high. Address the county clerk.

—Major C. E. L. B. Davis has submitted a report in favor of a bridge over the eastern branch at South Capitol street, Washington, D. C., estimated to cost $700,000.

Buildings.

—C. W. Stanton and associates have contracted for the erection of a grain elevator at Mobile, Ala., to be 56 ft. wide, 117 ft. long and 130 ft. high; engine and boiler-house about 30 x 40 ft., and a river conveyor will be attached 600 ft. long, with capacity of delivering 10,000 bushels of grain per hour; will have electric light plant and every modern convenience; capacity of elevator to be 250,000 bushels, and its handling capacity 175,000 bushels in 24 hours. The contract has been let to A. Maritzen and E. Lee Heidenrich, of Chicago.

—C. B. Colby and P. R. Foley have bought the Dauphin (Pa.) Car Works, and will spend about $50,000 in preparing the plant for making bridges and architectural and structural iron.

—The State Board of Transportation of Nebraska has ordered that the railroads entering Omaha shall, on May I, begin the erection of a Union Station. The Milwaukee and the Rock Island are, it is said, opposed to the plans submitted.

—The Ohio River Railroad Company is building a shop 108 x 80 ft. at Parkersburg, W. Va., for the repair and manufacture of passenger cars. A complete new apparatus for coal handling is also under way at the same place.

—The Erie Railroad Company is reported to have decided to build a new passenger station in Paterson, N. J., the plans for which have been prepared by Engineer George H. Blakely, Paterson.

—The Ramapo Wheel & Foundry Co. is adding to its manufacturing plant a new machine shop 100x60 feet and a new blacksmith shop 160x60 feet. The old blacksmith shop will be used for a setting-up shop, and the old machine shop will be used for storage purposes, etc. The new plant promises to be a most thoroughly modern and well-equipped establishment. The company will do away with all separate engines for power purposes and will derive its power from a central plant which is equipped with a large Westinghouse compound engine and two Westinghouse generators. From these generators will be derived the current for operating motors which will be used throughout the works. The planers will be equipped with individual motors as will the blowers. The smaller and lighter machinery will be operated in series with separate motors for each series.

Cars and Locomotives.

—The Baldwin Locomotive Works has contracted to build 32 additional locomotives to go to Russia. These engines are duplicates of the 20 ten-wheeled passenger engines lately shipped, but the tenders will have eight wheels instead of six. These engines have Vauclain compound cylinders and will burn naphtha.

—The Wason Car Manufacturing Co., of Springfield, Mass., besides having a large amount of steam car repair work, is building on its standard pattern of street cars at the rate of one per day. The company is building cars for the Hartford, Manchester & Rockville tramway the Blackstone Valley Railway, of Worcester, the Bristol & Plainville Tramway and a Springfield company. The company has also an order for cars from the Woronoco road, of Westfield.

—The South Baltimore Car Works has contracted to build 400 freight cars for the West Virginia & Pittsburgh Railroad Co., and 300 coal cars for several coal companies. It is expected that the works will soon be taken out of the hands of the receivers.

—The Elliott Car Works, Gadsden, Ala., are building 150 freight cars for the Chattanooga, Rome & Columbus. Nearly 400 men are now employed in these shops, and there are enough orders on hand to keep them employed for several months.

—The Standard Coupler Co. of New York, N. Y., has received an order from the Great Northern Railroad for 4,000 couplers.

—The Central Vermont Railroad Co. is having 13 passenger coaches built by Jackson & Sharp to replace those destroyed by fire last winter.

—The American Refrigerator Transit Company is building 50 refrigerator cars at its own shops. These cars will be fitted with the St. Louis coupler.

—The Lake Superior & Ishpeming road are reported as about to enter the market soon for 400 ore cars.

—The Chattanooga Southern has constructed for its own use 20 flat cars to be used in handling wood and charcoal for the Gordan Chemical Company, which has a plant at Round Mountain, on the line of the road.

—The Northern Ohio Railway has ordered from the Brooks Locomotive Works six mogul engines. These engines are to be the same as the standard freight engines of the Lake Erie & Western Railway.

—The Wheeling & Lake Erie has placed an order with the Cooke Locomotive Works for two switch engines and ten ten-wheelers.

—Some of the car manufacturers of this country are figuring on a bid for some cars for a railway in Hindoostan.

—The Baldwin Locomotive Works is reported as having shipped to the Westinghouse Electric & Manufacturing Company at Pittsburgh, the framework for the heavy electric locomotive on which work has been progressing for some time. The electric apparatus for this machine is to be supplied by the Westinghouse people. It is stated that the locomotive is about 30 ft. long and is mounted upon two 4-wheel trucks, and that when it is completed it will weigh 60 tons. The wheels are 42 in. in diameter and the locomotive will be operated by much the same mechanism as the ordinary electric motor, with the exception that the parts will be much stronger.

—An agreement made between the St. Charles Car Company and the receivers of the Galveston, La Porte & Houston Railway has been filed with the county clerk, under which the car company leases to the receivers three first-class coaches, three mixed coaches, three combination baggage and express cars, two caboose cars, fifty coal cars and fifty box cars for $66,200, of which $22,066.66 is paid in cash and the remainder evidenced by two notes of $22,066.66 each, due in one and two years after date respectively. Upon the payment of the last note the car company is to make a bill of sale for the cars upon payment by the receivers of the sum of $100. The receivers also give a chattel mortgage upon the property.

Iron and Steel.

—The Pencoyd Iron Works, according to press dispatches, has shut down a part of its works at West Manayunk, throwing out about 300 men. It is said that this temporary stopping of work has been caused by delay in the building of the Blackwell's Island bridge, for the steel work of which the company has the contract.

—The Buffalo Forge Co., Buffalo, N. Y., is sending out to iron foundries and all large industrial works in the United States and Canada a neatly illustrated circular entitled "A French Iron Foundry in 1789." Similarly every wood working house and every establishment having use for drying rooms of any nature will receive one of the circulars entitled "Air as an Industrial Factor." Both are full of interest.

—Last week the Pacific Rolling Mills of San Francisco resumed work, about 700 men on the payroll. During the two weeks shutdown the furnaces were altered to admit the use of oil for fuel.The mills expect to use about 100,000 barrels per year. This industrial estaolishment is the first on the Pacific coast to make so general a use of oil fuel in blast furnaces.

—The Shelby Iron Co., of Shelby, Ala., has issued a circular regarding the merits of Shelby charcoal car wheel iron. Last June a wheel made by the Barney & Smith Car Wheel Co., Dayton, Ohio, was tested in the presence of Mr. J. H. Harris, inspector for the Pennsylvania Railroad. It stood 504 blows of a 140 lb. weight falling 12 ft. It was made of Shelby iron and old wheels. In 1875 the Barney & Smith Mfg. Co., made a set of wheels of Shelby iron which were put in passenger service for test as to durability. They ran 70,000 miles, and two of the wheels, now in the possession of the Shelby Iron Co., would probably stand, easily, 25,000 miles more.

—The Basic City (Va.) Chilled & Rolled Iron Works has borrowed the sum of $100,000 on its property, and it is said will resume operations at an early date.

—The Colorado Fuel & Iron Co., has been awarded a contract by the Denver & Rio Grande Railway Co., for 6.000 tons of steel rails. This company produced in 1895 59,494 net tons of pig iron, 3,386 net tons of spiegel, 3,470 tons of castings, 4,357 net tons of cast pipe, 43,238 net tons of steel rails, 2,674 tons of spikes, 1,629 tons of angles and 15,904 net tons of merchant iron.

—The Ramapo Iron Works, of Hillburn, N. Y., has been awarded the contract to make all the castings for the Erie Railroad.

Machinery and Tools.

—The New York Central has ordered a Tabor molding machine, to be used in molding brake shoes and journal bearings. The expense of casting is so materially reduced by the use of this machine, that it is claimed no foundry having much uniform work to do can afford to be without it.

—The additions to the plant of the Springfield Machine Tool Company, Springfield, Ohio, under way for some time have been completed, and in connection with the new tools which have been installed, give this concern one of the most complete plants for the manufacture of machine tools in the country. Among the new tools lately purchased are a 48 x 48 in. x 24 ft. Gray planer, a 9 ft. improved Bickford radial drill, a No. 5 improved Landis grinder and others, including one of the company's own 24 ft. bed, 24 in. lathes. The new addition to the shop is 50 ft. wide by 100 ft. in length, with 18 ft. walls and light on three sides. The company also has a foundry and make castings for a number of the fine machine tool manufacturers of the country. Among orders lately received are six from England, covering all lines of the company's machine tools With one of the most modern and complete plants in the country and an excellent type of tools for their product, the Springfield Machine Tool Company are making a good record for sales and for satisfactory performance by their tools.

—The Pratt & Whitney Co. has completed special machinery for making the decimal gages for measuring sheet-metal tubes and wire adopted by the Railway Master Mechanics' Association, and are prepared to fill orders for the gages. About 500 gages have been ordered, several of the leading railroads having made the gage standard. There is every reason for believing that within two or three years no other gage will be employed by the railroad companies of America.

—The Lodge & Shipley Machine Tool Co., of Cincinnati, O., states that it has been giving special attention to the manufacture of a tool-room lathe, combining all the best points of a standard lathe with the quick change of feeds and screw cutting contained in its engine lathes. This lathe, the company states, also has graduated length and cross feeds and graduated set-over of tailstock; also, an improved taper attachment which requires the setting or releasing of only one screw to connect or disconnect it.

—The Chicago Pneumatic Tool Co., 1553 Monadnock Block, Chicago, Ill., states that during the past three months it has shipped to England and other foreign countries 63 of its hammers, and on February 4 another order was received from London for ten more pneumatic hammers the size used for beading flues and calking boilers. The company is bringing out some new air tools, and is making its hammers large enough for riveting stay-bolts. These hammers are guaranteed to bead two locomotive flues per minute and in calking and chipping boilers the company claims that one man with a pneumatic tool will do the work that four can do by hand.

—Earl C. Bacon, designer and builder of improved hoisting engines, No. 26 Cortlandt street, New York, reports having shipped more machines in January than in any January in eight years. Mr. Bacon's shipments range from ocean to ocean, so that he is able to know the tone of the market very generally, and he interprets the present as a most advantageous time for manufacturers to look for a greatly increased and healthy trade. He will shortly issue a 100-page catalog, which will be as complete a representation of the latest and best types of hoisting engines, crushing machinery and kindred machines as has been issued.

—The Rand Drill Co. of New York City has moved its office, 23 Park place, where it has been so many years, to the American Surety Building, 100 Broadway, corner of Pine street, where it will occupy the 12th floor. As an evidence that its machinery is growing in popularity among railway mechanics it has within a few days received orders from four different railroad companies for air compressors for driving tools in their machine shops.

—In the notice of the election of officers of the Vulcan Iron Works, Toledo, made in this column the name of the president was given as A. L. Backus. It should have read Alex. Backus.

Miscellaneous.

—The Truss Rail Joint Co. of Chicago has just taken an order for the equipment of 27 miles of main track on the Michigan Central Railroad with its rail joint.

—What is probably the largest locomotive form of boiler ever built, was recently designed by Mr. F. W. Dean, mechanical engineer,of Boston. The boiler is 10 ft. in diameter, has two corrugated furnaces, and has 5,300 square feet of heating surface.

—The Chicago Pneumatic Railway Gate Co. has certified to the change of its name to the United States Horseshoe Mfg. Co.

—The Lehigh Valley Coal Co. has begun work on its property at South Chicago and will expend probably $200,000 for docks, machinery and bridges.

—The National Railway Signal Co. of Sing Sing, N. Y., has been incorporated to manufacture railroad signals, both visual and audible. Capital $100,000, and directors, W. Irving Lee, Chester A. Weller, John Gibney, Thomas R. Wright, Wm. H. Cullen, Michael Garvey and David Greenthan, of Sing Sing.

—N. T. De Pauw, who was recently appointed receiver for the Ohio Falls Iron Works Co., at Louisville, will qualify at once and take charge of the company's affairs. An effort will be made to immediately resume operations in the works.

—The Pullman Co. is stated to have closed a contract with Crane & Co., of Fulton, W. Va., for 7,500,000 ft. of hardwood lumber.

—The Acme Railway Signal Co. incorporated Jan 27 is to manufacture railroad signals and other railroad devices in New York City. Capital, $300,000, and directors, Wm. F. Chester, Leonard S. B. Hopkins, of New York City; Theodore H. Enis, of Jersey City, N. J.

—Wharves.—Contract has been let at Norfolk, Va. to Wilson & Seay, of Lynchburg, for the erection of a wharf building 188x702 ft. at Pinner's Point for the Southern Railway.

—The "Falls" hollow stay-bolts have been in use on many of the leading railroads in this country for years, with the greatest satisfaction, and the makers have a large number of very strong testimonials from railroad officials. The Northern Pacific Railroad, writing to the Manufacturers, says: "Replying to your communication of recent date concerning the satisfaction we have had with hollow stay-bolts received from you, I wish to say that thus far the stay-bolts have rendered us excellent satisfaction. The quality of the iron seems to be good, and meets all requirements thus far."

—The Pennsylvania Company is improving its facilities for handling iron ore at Erie, Pa., and the track facilities are to be enlarged and rearranged, so that a much larger movement can be accommodated than heretofore. The channels adjoining the docks are being deepened by Hingston & Woods, of Buffalo. The new machinery for the rapid handling of ore is to be put up by the Brown Hoisting & Conveying Machine Co., of Cleveland. Probably over $175,000 will be spent in these improvements.

—The Consolidated Cattle Car Co. has been organized with a capital of $2,000,000, and with offices in Chicago and St. Louis, to take the cars and carry on the business of the late Hicks Stock Car Co., whose property was sold at auction recently. Charles E. Kimball is president of the company and Henry W. Gays vice president. The company operates 3,000 cattle cars. It may be interesting to note that the present owners are largely interested in the Canda Cattle Car Co., and that the initials used on the cars of both companies (C. C. C. Co.) are identical.

—An order for 16,000,000 feet of Oregon fir was recently let to a mill on the Pacific coast. The timbers are to be used in the construction of a large dock at Marquette, Mich. Michigan will cut fully 300,000,000 feet of Canadian logs next season.

—Options have been taken by the Pittsburgh, Monongahela & Wheeling Railroad upon 8,000 feet of river frontage, with provision for the securing of 15,000 feet if desired, at Benwood, below the Wheeling, W. Va., terminals of the line at which point will be established a mammoth shipping point. Coal tipples and harbors will be put in and it bids fair to become one of the most important coal shipping stations on the Ohio river. Much coal handled at present via the pools of the Monongahela can be moved with far more expediency by the use of these conveniences.

—The Bailey Triple Ledge Gold Mining Co. has been incorporated at San Diego to construct highways, rail roads, electric, steam or other motive power, and chutes to and from mines. Capital stock, $100,000. Incorporators: L. H. Bailey of Banner. Cal.; A. C. Nason and O.C. Dranga of San Diego; E. A. Stanley of Julian, Cal., and James A. Jasper of Ramona, Cal.

—Mr. A. Morrison, late roadmaster of the Lehigh Valley Railroad, has accepted the position of mechanical engineer with Dilworth, Porter & Co., of Pittsburgh, for the special purpose of pushing the Goldie tie plate. Mr. Goldie states that so much of his time has been required in answering inquiries and giving information relative to his tie plate that he has found it impossible to do justice to all inquiries. Mr. Morrison has, therefore, been called in to attend specially to the technical details of the tie plate business.

—The Westinghouse Electric & Manufacturing Co. has lately received orders to equip an electric railway in the Isle of Man. Another order has come to hand for electric railway apparatus for the City of Coventry in England, and a third for electric motors and railway generators for a road at Cape Town, South Africa. The company is also about to ship equipment to fill an order for an electric railway apparatus at Bangkok, Siam, India.

—As a result of the illness of both the president and the vice president of the Pittsburgh Steel & Iron Company, The Union Trust Company, of Pittsburgh, has been appointed receiver on the application of the Vega Iron Company, of Duluth. It it said that the corporation has ample financial backing and that the present condition of affairs is wholly a result of the inability of the chief officers to give the affairs of the company their personal attention.

—It is announced that the Oshkosh car shops, which were closed in 1893, will be opened in a short time, starting with a good order for freight cars.

—The Universal Car Seal Co. has been organized in St. Louis with the following-named stockholders: Lewis Bierman, S. W. Summers, I. B. Rosenthal, Adolph Baer and L. A. Brown. The seal is somewhat different to any now on the market, being made of glass.

—The Denver Automatic Car Coupler Co., of Denver, Colo., has been organized with $100,000 capital stock, by F. H. Hyatt, H. L. Marsh and L. L. Moe.

—The Rowell-Potter Safety Stop Company, Chicago, has nearly finished an extension of its system on the Metropolitan Elevated road of Chicago and expects to equip the whole line.

—Officers of the Philadelphia & Reading, which controls the Atlantic City Railroad, announce that the entire road from Camden to Atlantic City, N. J., 56 miles, is to be equipped with Hall automatic block signals- This road does a heavy passenger business in the summer, and it is said that the signals will be ready for use by the opening of the coming season.

Lidgerwood Cableways for the Panama Canal.

Mr. Spencer Miller, M. E., engineer, of the department of hoisting and conveying machinery of the Lidgerwood Manufacturing Co., New York City, who recently went abroad in the interests of that company, has just closed a contract with the Compagnie Nouvelle Du Canal De Panama at Paris, for seven Lidgerwood cableways to be used on the Panama canal. This company is one which has recently been formed to complete the great Panama canal, and the seven cableways will be used exclusively for earth excavating. They will be equipped with all the latest improvements, including the patent aerial dump, which is such an important feature of these machines, the apparatus throughout being similar in construction to the twenty Lidgerwood cableways used on the Chicago main drainage canal, except that the Panama cableways will have fixed towers and anchorages. The spans will range from 250 to 300 feet.

This order was not placed until after a most careful and extended investigation had been made of the various apparatus available for canal excavation purposes.

Engineers were sent by the Compagnie Nouvelle Du Canal De Panama from Paris to examine the Lidgerwood cableways and other excavating machinery in use at Chicago on the canal there building. The result of their investigation was a most flattering report in favor of the Liderwood cableways and the negotiations then begun have resulted in the large order secured by Mr. Miller.

This is one of the largest single orders for cableways of any description ever received by any concern in this country from abroad, and points to a world-wide appreciation of the merits of the Lidgerwood cableway that fully justifies the claim advanced by its manufacturers that it is the most perfect, economical and efficient apparatus of its kind ever devised.